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Letter to the Editor

Searching for Trans Ethyl Methyl Ether in Orion KL ⋆,⋆⋆

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ABSTRACT

We report on the tentative detection of *trans* Ethyl Methyl Ether (tEME), t-$CH_3CH_2OCH_3$, through the identification of a large number of rotational lines from each one of the spin states of the molecule towards Orion KL. We also search for *gauche-trans*-n-propanol, Gt-n-$CH_3CH_2CH_2OH$, an isomer of tEME in the same source. We have identified lines of both species in the IRAM 30m line survey and in the ALMA Science Verification data. We have obtained ALMA maps to establish the spatial distribution of these species. Whereas tEME mainly arises from the compact ridge component of Orion, Gt-n-propanol appears at the emission peak of ethanol (south hot core). The derived column densities of these species at the location of their emission peaks are $\leq(4.0\pm0.8)\times10^{15}$ cm^{-2} and $\leq(1.0\pm0.2)\times10^{15}$ cm^{-2} for tEME and Gt-n-propanol, respectively. The rotational temperature is $\sim$100 K for both molecules. We also provide maps of CH_3OCOH, CH_3CH_2OCOH, CH_3OCH_3, CH_3OH, and CH_3CH_2OH to compare the distribution of these organic saturated O-bearing species containing methyl and ethyl groups in this region. Abundance ratios of related species and upper limits to the abundances of non-detected ethers are provided. We derive an abundance ratio $N(CH_3OCH_3)/N(\text{tEME}) \geq 150$ in the compact ridge of Orion.

Key words. ISM: abundances – ISM: clouds – ISM: individual objects (Orion KL) – ISM: molecules – radio lines: ISM – surveys

1. Introduction

The spectral millimeter-wave survey of Orion KL carried out with the IRAM 30m radio telescope (Tercero et al. 2010; Tercero 2012) shows more than 15400 spectral features of which about 11000 have been identified and attributed to 50 molecules (199 different isotopologues and vibrational modes). To date, there have been several works based on these data. As the result of a fruitful collaboration with spectroscopy laboratories, 3000 previously unidentified lines have been assigned to new species in the interstellar medium (ISM). We have detected in space 16 new isotopologues and vibrationally excited states of abundant molecules in Orion for the first time (Demyk et al. 2007; Margulès et al. 2009, 2010; Carvajal et al. 2009; Tercero 2012; Motiyenko et al. 2012; Daly et al. 2013; Coudert et al. 2013; Haykal et al. 2014; López et al. 2014) as well as four new molecules (Tercero et al. 2013; Cernicharo et al. 2013; Kolesniková et al. 2014). These identifications reduce the number of unidentified lines and mitigate line confusion in the spectra. Nevertheless, many features still remain unidentified and correspond to new species that we have to search and identify. Formates, ethers, acetates, alcohols, and cyanides are the best candidates for this purpose in Orion.

The recent search for *trans* Ethyl Methyl Ether (tEME) in selected hot cores (Sgr B2(N-LMH) and W51 e1/e2) by Carroll et al. (2015) only provides upper limits to tEME. Hence, the results from that work do not confirm the previous tentative identification of this species by Fuchs et al. (2005) towards W51 e1/e2.

A systematic line survey with most weeds removed permits us to address the problem of the abundances of isomers and derivatives of key species, such as methyl formate (A. López et al. in preparation), through combined IRAM and ALMA studies.

In this Letter, we report on the tentative detection of tEME towards the compact ridge (CR) of Orion KL. We have detected emission of features arising from the five spin states at 3, 2, and

⋆ This paper makes use of the following ALMA data: ADS/JAO.ALMA#2011.0.00009.SV. ALMA is a partnership of ESO (representing its member states), NSF (USA), and NINS (Japan) with NRC (Canada), NSC, and ASIAA (Taiwan), and KASI (Republic of Korea), in cooperation with the Republic of Chile. The Joint ALMA Observatory is operated by ESO, AUI/NRAO, and NAOJ. This work was also based on observations carried out with the IRAM 30-meter telescope. IRAM is supported by INSU/CNRS (France), MPG (Germany), and IGN (Spain).

⋆⋆ Appendix A (online Figures and Tables) is only available in electronic form via http://www.edpscience.org

1 mm with the IRAM 30m telescope and the ALMA interferometer. In addition, several unidentified lines of these data have been identified as belonging to the *gauche-trans* conformer of n-propanol (an isomer of tEME). ALMA maps of organic saturated O-bearing species containing methyl, ethyl, and propyl groups, abundance ratios of related species, and upper limits to the column densities of non-detected ethers are presented and discussed in Sect. 4.

2. Observations

IRAM 30m: New data of the IRAM 30m telescope, which complement and improve those of Tercero et al. (2010), were collected in August 2013 and March 2014 towards Orion KL (see Tercero et al. 2010 and López et al. 2014, for information about the previous data set). Frequencies in the ranges 80.7−116, 122.7−161.2, 199.7−291.0, 291.4−306.7 GHz, were observed with the EMIR receivers connected to the FFTS (200 kHz of spectral resolution) spectrometers. We pointed towards IRc2 source at $\alpha_{2000.0} = 5^h35^m14\overset{s}{.}5$, $\delta_{2000.0} = -5°22'30\overset{''}{.}0$, corresponding to the survey position (see Sect. 4). We observed an additional position to target the CR: $\alpha_{2000.0} = 5^h35^m14\overset{s}{.}3$, $\delta_{2000.0} = -5°22'37\overset{''}{.}0$ (see Sect. 4). The observations were performed using the wobbler switching mode with a beam throw in azimuth of ±120″. The intensity scale was calibrated using the atmospheric transmission model (ATM, Cernicharo 1985; Pardo et al. 2001). Focus and pointing were checked every 1−2 hours on planets or nearby quasars. System temperatures were in the range of 100−800 K from the lowest to highest frequencies. Half power beam width (HPBW) ranged from 31″ to 8″ from 80 to 307 GHz (HPBW[arcsec]=2460/Freq.[GHz]). The data were reduced using the GILDAS package[1].

ALMA SV: The ALMA Science Verification (SV) data[2] were taken in January 2012 towards the IRc2 region in Orion. The observations were carried out with 16 antennas of 12 m in Band 6 (213.715-246.627 GHz). The primary beam was ≃27″. Spectral resolution was 0.488 MHz corresponding to a velocity resolution of 0.64 km s^{-1}. The observations were centred on coordinates: $\alpha_{J2000} = 05^h35^m14\overset{s}{.}35$, $\delta_{J2000} = -05°22'35\overset{''}{.}00$. The CASA software[3] was used for initial processing and then the visibilities were exported to the GILDAS package. The line maps were cleaned using the HOGBOM algorithm (Högbom 1974). The synthesized beam ranged from $2\overset{''}{.}00\times1\overset{''}{.}48$ with a PA of 176° at 214.0 GHz to $1\overset{''}{.}75\times1\overset{''}{.}29$ with a PA of 164° at 246.4 GHz. The brightness temperature to flux density conversion factor is 9 K for 1 Jy per beam.

3. Results

3.1. Search for *trans* Ethyl Methyl Ether

ALMA SV data: Frequency predictions from Fuchs et al. (2003) and dipole moments measured by Hayashi & Kuwada (1975) of tEME were implemented in MADEX (Cernicharo 2012) to model the emission of this species and search for it towards Orion KL. Using the ALMA SV data, we extracted the averaged spectrum over 5×5 pixels (1″×1″) around the CH_3OCH_3 emission peak of the CR component (Position A; see Sect. 4). The advantage of ALMA with respect to single dish telescope data (see below) is the drastic reduction

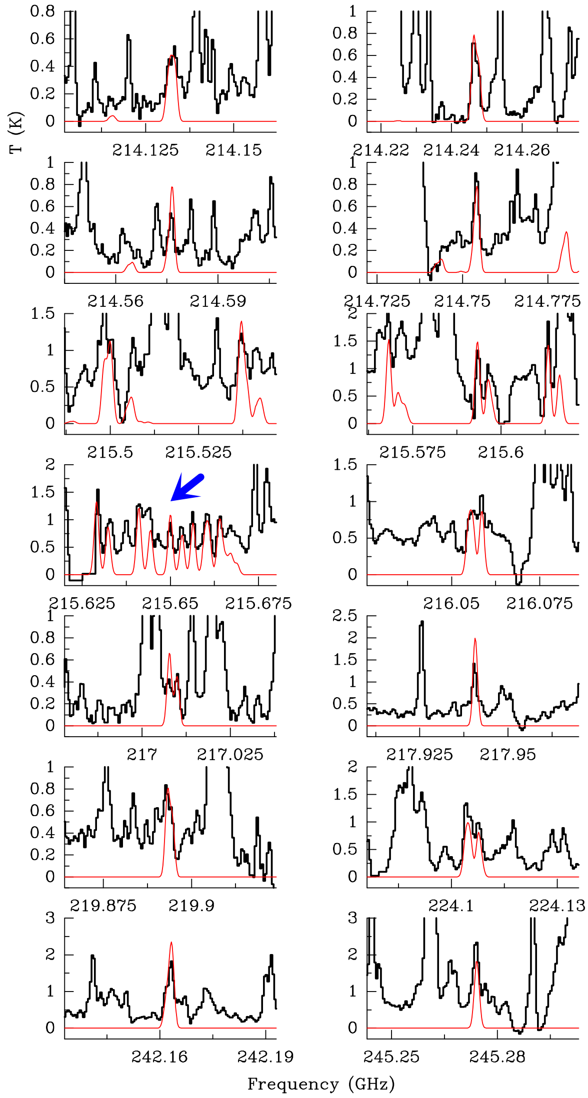

Fig. 1. Selected lines of *trans* Ethyl Methyl Ether, *t*-$CH_3CH_2OCH_3$, towards Orion KL detected with the ALMA interferometer in Position A (see text). A v_{LSR} of +7.5 km s^{-1} is assumed.

of the confusion limit. The ALMA SV data show the presence of tEME as shown in Fig. 1 (selected lines) and Fig. A.1 (all lines favourable for detection [corresponding to *b*−type transitions with upper level energies up to 300 K and large line strenghts, $S_{ij}\geq1$] present in the ALMA SV frequency range). The model that best fits the data is shown with the red line. The assumed parameters are a source size of 3″, $v_{LSR} = +7.5$ km s^{-1}, $\Delta v = 2.0$ km s^{-1}, and $T_K = 100\pm20$ K. Using MADEX and assuming local thermodynamic equilibrium (LTE), we obtain $N_{g.s.}$(tEME) ≤ (4.0±0.8)×10^{15} cm^{-2}. In our models, rotation temperature and column density values are given with their corresponding uncertainty and we obtained them by fitting all available lines by eye. We adopted the source size in agreement with the emission of the maps (see below). In addition, a considerable number of unblended features allows us to fix the radial velocities and line widths. According to our model, in the ALMA frequency range only 33% of the detectable lines of tEME (102 lines) are totally hidden by the emission of stronger lines of other species. At least 46 lines (45% of the detectable lines) shown in Fig. A.1 are free of blending, i.e. these lines are present at the expected radial velocity and there are

[1] http://www.iram.fr/IRAMFR/GILDAS
[2] http://almascience.eso.org/almadata/sciver/OrionKLBand6/
[3] http://casa.nrao.edu

no other species with significant intensity at the same observed frequency (±3 MHz). Another point to ensure this tentative detection is that the forest of lines emitted by tEME between 215.5 and 215.7 GHz is not covered by lines of abundant molecules in the source allowing the detection of several lines that follow a straightened pattern (see Fig. 1). Hence, there are several clues that could reveal the presence of this species in the CR of Orion KL, but further analysis exploring new available ALMA data and modelling all the molecular content of the CR is needed to give the definitive detection in space of tEME. Table A.1, which is only available online, gives line parameters and blends of all lines of favourable transitions in the ALMA SV data. The spatial distribution of tEME is shown in Fig. 2. Lines that we found to be unblended at the Position A appear blended with emission from other components in the averaged spectrum (see the case of the 30m data). We selected a line at 245.274 GHz, which is mixed with some emission from extreme velocities of $^{34}SO_2$ and SO_2. Nevertheless, the emission of tEME at Position A in Fig. 2 is not blended (see Sect. 4).

IRAM 30m data: To search for tEME in the IRAM data, a synthetic spectra of tEME (red curve in Fig. A.2, only available online) was obtained with MADEX assuming LTE and adopting the following physical parameters: source diameter 3″, $T_K = 100{\pm}30$ K, $v_{LSR} = +7.5$ km s^{-1}, $\Delta v = 1.5$ km s^{-1}; and a column density of $(9{\pm}3){\times}10^{15}$ cm^{-2} for the ground state (g.s.) of tEME. According to our model, all favourable lines for detection in the 30m data were detected or were blended with features from more abundant species. Nevertheless, owing to the weakness of the features (T_{MB} <0.1 K at 3 mm, $T_{MB} < 0.2$ K at 2 mm, and T_{MB} <1 K at 1.3–0.9 mm) and the high level of line confusion at $\sim$1 mm, only a few lines were mostly free of blending with other species in this domain. Whereas the synthetic beam of the ALMA SV is 1.″90×1.″40 in the 30m the beam diameter ranging from 30″ to 8″. Therefore, in the 30m data, the spectrum is a mix of all molecules from all source components (average spectrum over the beam) given rise to a high level of line blending and line confusion. Table A.2, which is only available online, shows line parameters, intensity provided by the model, and blends of all lines of favourable transitions in the 30m data.

3.2. Search for *gauche-trans-n-propanol*

All lines of Gt-$CH_3CH_2CH_2OH$, an isomer of C_3H_8O (as well as tEME), reported by Maeda et al. (2006) and the dipole moments from Abdurakhmanov et al. (1969) were used to derive its rotational constants and to implement this species in MADEX. We conducted the search for Gt-n-propanol in the ALMA SV data at two different positions: Position A and the position where the emission peak of ethanol is located (Position B; see Sect. 4). We assign several unidentified lines in the source at Position B to this species. According to our model ($d_{sou} = 3''$, $v_{LSR} = +8.0$ km s^{-1}, $\Delta v = 3.0$ km s^{-1}, $T_K = 100{\pm}20$ K, and $N_{g.s} \leq (1.0{\pm}0.2){\times}10^{15}$ cm^{-2}), many of the lines are below the detection limit although the strongest features are detected. Unfortunately, several lines remain blended (see Fig. A.3, only available online). A few lines of this species are also detected in the IRAM 30m data at the survey position (Fig. A.2 bottom panel, which is only available online; model parameters: $d_{sou} = 3''$, $v_{LSR} = +8.0$ km s^{-1}, $\Delta v = 1.5$ km s^{-1}, $T_K = 100{\pm}20$ K, and $N_{g.s} \leq (2.0{\pm}0.4){\times}10^{15}$ cm^{-2}). Table A.3, which is only available online, shows line parameters for the detected lines. The derived upper limit to its column density (assuming the same physical parameters than those of the tEME ALMA model) at Position A is $\leq(3.0{\pm}0.6){\times}10^{14}$ cm^{-2}. The spatial distribution of

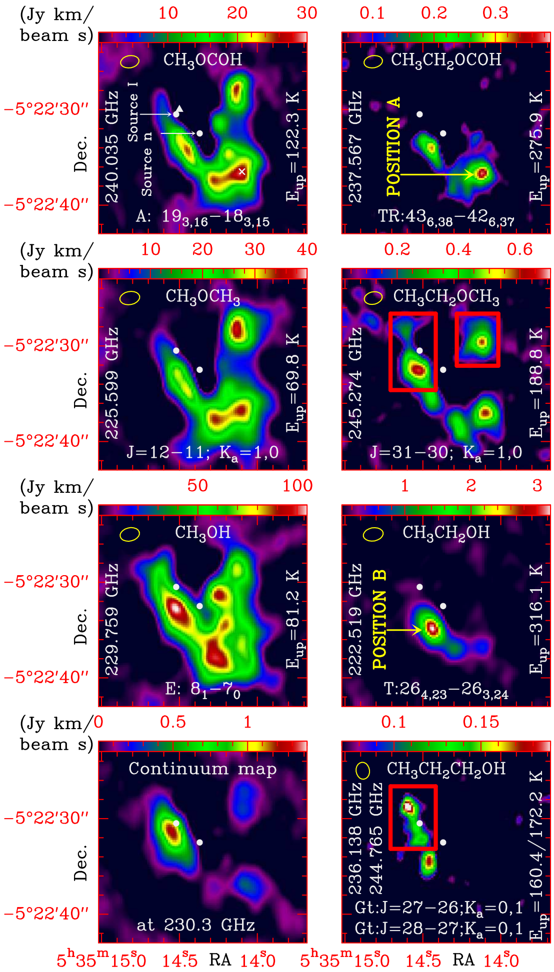

Fig. 2. ALMA maps of organic saturated O-bearing molecules in Orion KL which have been detected containing both the methyl and the ethyl group, as well as a map of Gt-n-propanol and a continuum map at the central frequencies of the ALMA SV band (~230 GHz). Emission that probably arises from blended species in these maps is confined inside red rectangles The yellow ellipse at the top left corner of the maps represents the ALMA synthetic beam. *Triangle symbol:* IRAM 30m 'survey position' (see Sect. 2). *Cross symbol:* IRAM 30m compact ridge position (see Sect. 2). *Position A:* Compact ridge (coordinates $\alpha_{2000.0} = 5^h35^m14.^s1$, $\delta_{2000.0} = -5°22'37.''9$). *Position B:* south hot core (coordinates $\alpha_{2000.0} = 5^h35^m14.^s4$, $\delta_{2000.0} = -5°22'34.''9$).

this species around Position B is shown in Fig. 2. To perform the ALMA map, we averaged the emission between v_{LSR} 6 and 9 km s^{-1} of two lines (lines at 236.138 and 244.765 GHz). Emission around source *I* should be due to other less abundant species in Orion (we did not find Gt-n-propanol at these positions).

4. Discussion

Species containing the functional groups formate, alcohol, and ether have been detected in Orion with both the methyl and ethyl groups (methyl formate (MF), ethyl formate (EF), methanol, ethanol, dimethyl ether (DME), and tEME). ALMA maps for the spatial distribution of these species as well as Gt-n-propanol are shown in Fig. 2. To address the flux filtered out by ALMA and the accuracy of the maps in a larger energy range, the following discussion is also based on the maps shown in Fig. 5 of Feng et al. (2015; maps performed mixing SMA and IRAM 30m data) with MF, DME, methanol, and ethanol. For MF, DME, and

methanol the spatial distribution and the position of the emission peaks are in agreement with those of the maps presented in this work (note, however, that the ALMA maps provide a more detailed structure at small scales, i.e. $\leq 5''$). For ethanol, we note a more extended spatial distribution in the map of Feng et al. (2015) mostly due to the lower energy of the transition involved. Nevertheless, the emission peak of ethanol is located at the same position.

For the methyl species, we note: i) a rather similar spatial structure: the three species present the V shape distribution of several clumps (at least six) studied by Favre et al. (2011) for the distribution of MF, which was mapped using data from the Plateau de Bure Interferometer (PdBI); ii) that although Brouillet et al. (2013) probed a striking similarity between the spatial distributions of CH_3OCH_3 and CH_3OCOH, we found some differences in the relative intensities of both species. These differences could be mostly due to different excitation temperatures of the involved transitions; and iii) although methanol also follows this V shape structure, a displacement of the intensity peaks is observed with respect to MF. This behaviour suggests methanol as a possible precursor of MF and DME (see also Neill et al. 2011).

Comparing the methyl and ethyl species, we note: i) a reduced spatial distribution of the three ethyl species with respect to their methyl counterpart; ii) the two emission peaks of EF are correlated with those found in MF; iii) the emission peak of tEME is at the same position as the DME peak at the CR (Position A); and iv) the emission peak of ethanol (Position B) is displaced 2″ south-west from the methanol peak.

Concerning the ethyl and propyl species, we note: i) a close correlation between EF and tEME; and ii) ethanol also presents a "V" shape structure (see Fig. 5 of Feng et al. 2015) with the bulk of the emission located away from the CR and coinciding with that of Gt-n-propanol. The ethanol/propanol peak is displaced 1.″5 south from the ethylene glycol $(CH_2OH)_2$ peak (Brouillet et al. 2015), which is a double alcohol and we could naively expect to have the same spatial distribution. Whereas the ethylene glycol peak corresponds to the $^{13}CH_3OH$ peak, the ethanol/propanol peak is the same as that of deuterated methanol (CH_2DOH; see Peng et al. 2012).

Table 1 shows derived column densities and ratios for related species. The derived ratios and the spatial distribution of these molecules suggest important gas phase processes after the evaporation of the mantles of dust grains in hot cores. Possible reactions of the methoxy radical (CH_3O), detected recently in space (Cernicharo et al. 2012), with other species could lead to the increase of chemical complexity in hot cores and hot corinos (Balucani et al. 2015). The spatial stratification of the different species also suggests the time dependent effects on the chemistry of the gas. The detection of the less stable isomers of some species (Tercero et al. 2013) also points in this direction.

To summarize, a combined IRAM 30m and ALMA SV data study allows us to provide a solid starting point to assess the identification of tEME in the ISM. In addition, some unidentified lines in the source have been assigned to another C_3H_8O isomer, Gt-n-propanol. ALMA maps show different spatial distributions for these species. Whereas tEME seems to mainly arises from the CR component (as well as EF) [Position A], emission from Gt-n-propanol could be located at the south hot core (at the same position as the emission peak of ethanol) [Position B]. The CR is no longer the main host of all organic saturated O-bearing species in Orion (see also Peng et al. 2013 for the spatial distribution of acetone and A. López et al. in preparation for the acetic acid emission).

Table 1. Column densities and ratios

Species	$N_{g.s.}$ ($\times10^{15}$) [cm^{-2}]	N Ratio
CH_3OCH_3 (DME)	$600\pm120^{(a),(b)}$	
$CH_3CH_2OCH_3$ (tEME)	$\leq 4.0\pm0.8^{(a)}$	DME/tEME ≥ 150
$CH_3CH_2OCH_2CH_3$ (Tt-DEE)†	$\leq 1.0\pm0.2^{(a)}$	DME/Tt-DEE ≥ 600 tEME/Tt-DEE ≥ 4
CH_3OCHCH_2 (*cis*-MVE)††	$\leq 0.5\pm0.1^{(a)}$	DME/*cis*-MVE ≥ 1200 tEME/*cis*-MVE ≥ 9
CH_3OCOH (MF)	$240\pm50^{(a),(b),(c)}$	
CH_3CH_2OCOH (EF)	$2.0\pm0.4^{(a),(d)}$	MF/EF $\simeq 120$
CH_3OH (MetOH)	$2700\pm500^{(b),(e),(f)}$	
CH_3CH_2OH (EtOH)	$60\pm10^{(b),(d),(e)}$	MetOH/EtOH $\simeq 45$
Gt-$CH_3CH_2CH_2OH$ (PropOH)	$1.0\pm0.2^{(e)}$	MetOH/PropOH $\simeq 2700$ EtOH/PropOH $\simeq 60$

†: *trans-trans* Diethyl ether. ††: *cis* Methyl vinyl ether. ***(a):*** Position A; same physical parameters of the ALMA tEME model (see Sect. 3.1). ***(b):*** Three kinetic temperatures: 50±10, 150±30, and 250±75 K. ***(c):*** b type lines fitted (a type lines are optically thick); another component has been included to properly fit the observed line profiles ($v_{LSR} = +9$ km s^{-1}, $\Delta v = 4$ km s^{-1}, $T_K = 150\pm30$ K, $N_{g.s} = (1.0\pm0.2)\times10^{17}$ cm^{-2}). ***(d):*** *trans+gauche*. ***(e):*** Position B; assuming the same physical parameters of the ALMA Gt-n-propanol model (see Sect. 3.2). ***(f):*** $^{12}C/^{13}C = 45$ (Tercero et al. 2010).

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Appendix A: Online Figures and Tables

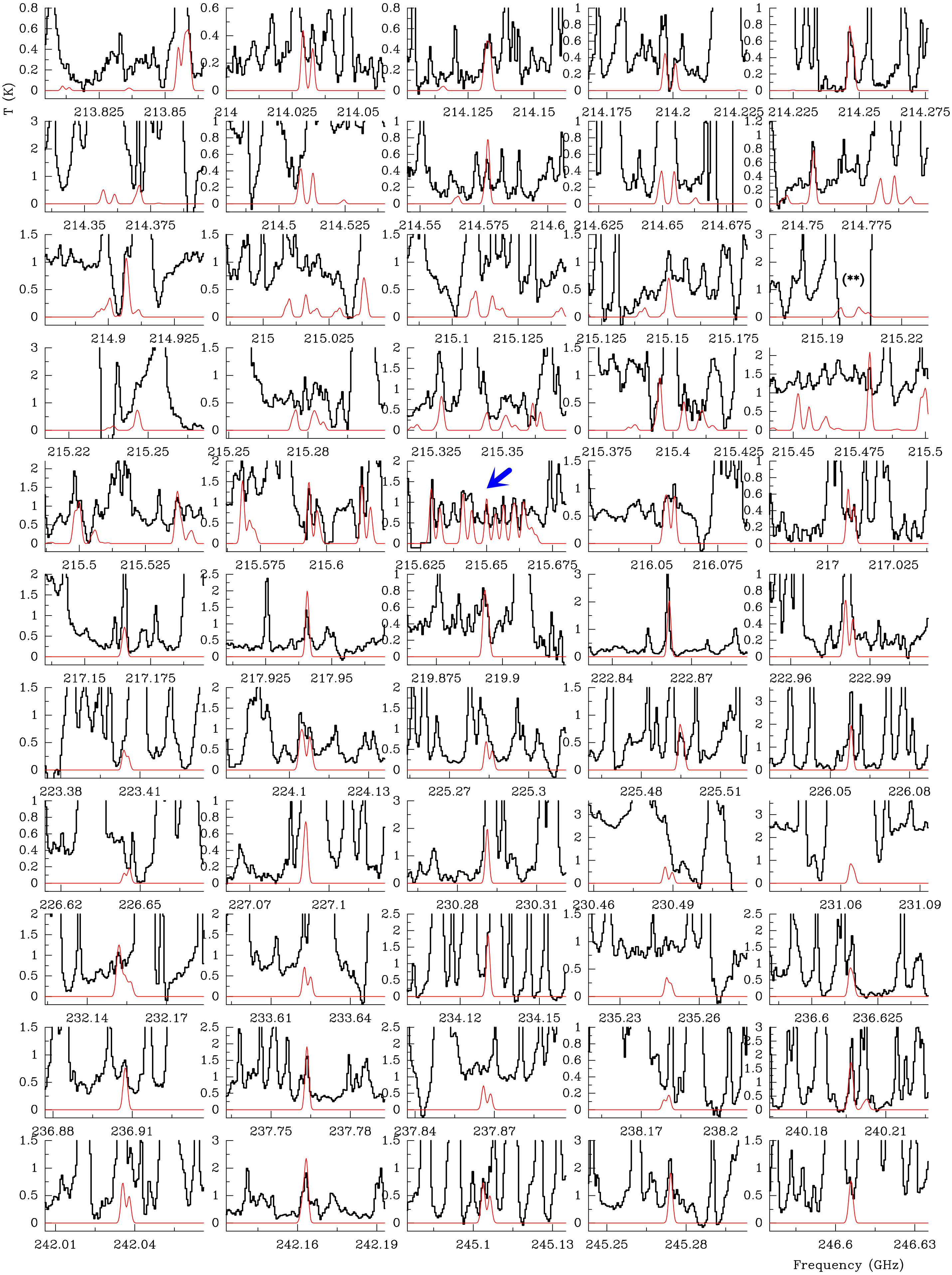

Fig. A.1. Lines of *trans* Ethyl Methyl Ether, *t*-$CH_3CH_2OCH_3$, towards Orion KL detected with the ALMA interferometer in Position A (see text). (**): Features blended with SO (see Table A.1; artifacts in the spectrum due to the cleaning process). A v_{LSR} of +7.5 km s^{-1} is assumed.

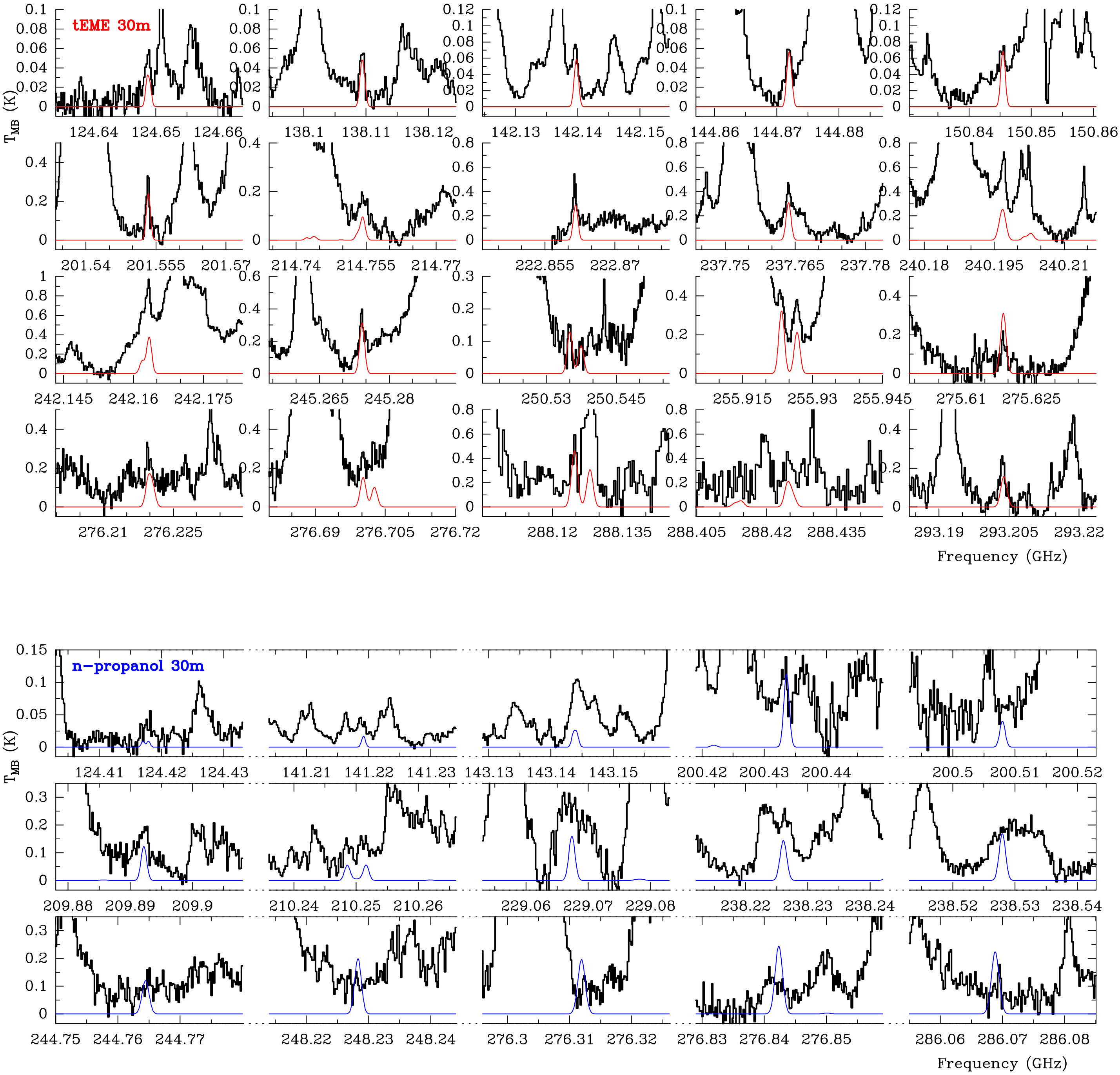

Fig. A.2. *Top panel*: selected lines of *trans* Ethyl Methyl Ether, *t*-$CH_3CH_2OCH_3$, towards Orion KL detected with the IRAM 30m telescope. Data in the frequency range 124−151 GHz are those of the survey position. From 201 to 293.5 GHz the data are those of the CR (see Sect. 2), where the emission peak of organic saturated O-rich species such as dimethyl ether (CH_3OCH_3) and methyl formate (CH_3OCOH) is located (Favre et al. 2011; Brouillet et al. 2013). A v_{LSR} of +7.5 km s^{-1} is assumed. *Bottom panel*: selected lines of *gauche-trans*-n-Propanol, Gt-n-$CH_3CH_2CH_2OH$, towards Orion KL detected with the IRAM 30m telescope. A v_{LSR} of +7.5 km s^{-1} is assumed.

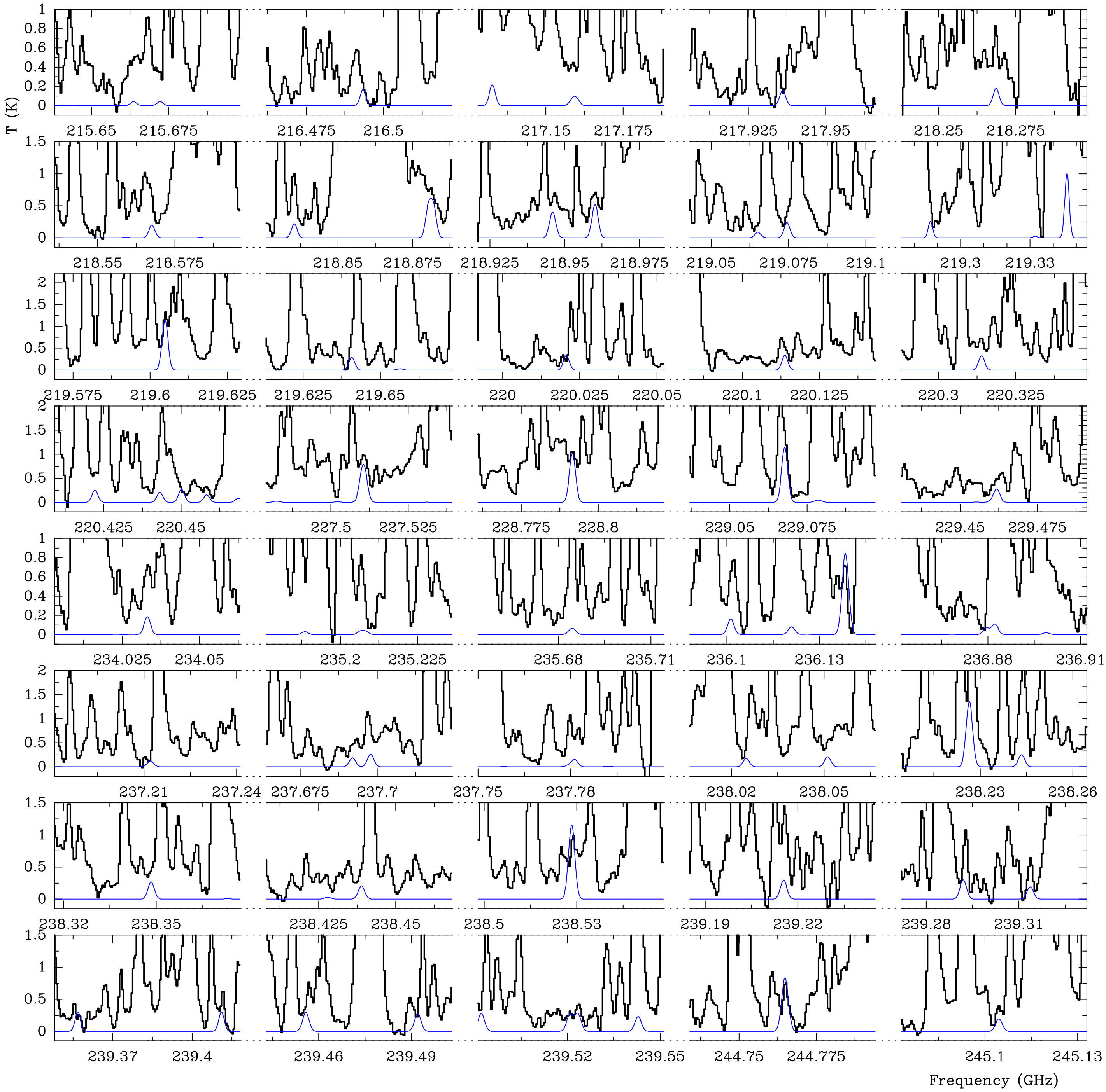

Fig. A.3. Lines of *gauche-trans*-n-propanol, Gt-n-$CH_3CH_2CH_2OH$, towards Orion KL detected with the ALMA interferometer in Position B (see text). A v_{LSR} of +8 km s^{-1} is assumed.

Table A.1. Lines of *trans*-$CH_3CH_2OCH_3$ in ALMA SV data

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed frequency (MHz)	T (K)	Blends
tEME-EE'	$31_{5,27}$-$31_{4,28}$	213854.674	220.5	16.34	...	...	CH_3CH_2OH
tEME-EE	$31_{5,27}$-$31_{4,28}$	213854.982	220.5	16.44	...	...	"
tEME-AE	$31_{5,27}$-$31_{4,28}$	213855.220	220.5	16.40	...	...	"
tEME-EE	$28_{5,23}$-$28_{4,24}$	213856.708	185.7	14.17	...	...	"
tEME-AE	$28_{5,23}$-$28_{4,24}$	213857.473	185.7	13.94	...	...	"
tEME-EE'	$28_{5,23}$-$28_{4,24}$	213857.509	185.7	13.69	...	...	"
tEME-EA	$31_{5,27}$-$31_{4,28}$	213858.239	220.5	16.52	...	...	"
tEME-AA	$31_{5,27}$-$31_{4,28}$	213858.632	220.5	16.53	...	...	"
tEME-EA	$28_{5,23}$-$28_{4,24}$	213859.015	185.7	14.70	...	...	"
tEME-AA	$28_{5,23}$-$28_{4,24}$	213859.367	185.7	14.73	...	...	"
tEME-EE'	$30_{5,26}$-$30_{4,27}$	214028.729	208.6	15.58	...	...	CH_3COCH_3
tEME-EE	$30_{5,26}$-$30_{4,27}$	214029.157	208.6	15.76	...	...	"
tEME-AE	$30_{5,26}$-$30_{4,27}$	214029.345	208.6	15.68	...	...	"
tEME-EA	$30_{5,26}$-$30_{4,27}$	214032.539	208.6	15.91	214032.3 †	0.50	
tEME-AA	$30_{5,26}$-$30_{4,27}$	214032.539	208.6	15.91	†		
tEME-EE	$27_{5,22}$-$27_{4,23}$	214131.118	174.9	13.15	214132.6	0.58	
tEME-AE	$27_{5,22}$-$27_{4,23}$	214132.010	174.9	12.80	†		
tEME-EE'	$27_{5,22}$-$27_{4,23}$	214132.166	174.9	12.46	†		
tEME-EA	$27_{5,22}$-$27_{4,23}$	214133.150	174.9	14.07	†		
tEME-AA	$27_{5,22}$-$27_{4,23}$	214133.486	174.9	14.14	†		
tEME-EE'	$29_{5,25}$-$29_{4,26}$	214196.531	196.9	14.73	214196.8	0.94	
tEME-EE	$29_{5,25}$-$29_{4,26}$	214197.122	196.9	15.01	†		
tEME-AE	$29_{5,25}$-$29_{4,26}$	214197.239	196.9	14.88	†		
tEME-EA	$29_{5,25}$-$29_{4,26}$	214200.673	196.9	15.31	214201.4	0.41	
tEME-AA	$29_{5,25}$-$29_{4,26}$	214201.091	196.9	15.31	†		
tEME-EE'	$21_{2,20}$-$20_{1,19}$	214246.202	93.7	7.76	214246.5	0.72	
tEME-EE	$21_{2,20}$-$20_{1,19}$	214246.202	93.7	7.76	†		
tEME-AE	$21_{2,20}$-$20_{1,19}$	214246.332	93.7	7.76	†		
tEME-EA	$21_{2,20}$-$20_{1,19}$	214247.602	93.7	7.76	†		
tEME-AA	$21_{2,20}$-$20_{1,19}$	214247.732	93.7	7.76	†		
tEME-EE'	$26_{5,22}$-$26_{4,22}$	214355.828	164.4	2.47	...	...	CH_3CH_2OH; SO
tEME-EE'	$28_{5,24}$-$28_{4,25}$	214356.510	185.7	13.69	...	...	"
tEME-AE	$26_{5,22}$-$26_{4,22}$	214356.963	164.4	2.08	...	...	"
tEME-EE	$26_{5,22}$-$26_{4,22}$	214357.232	164.4	1.63	...	...	"
tEME-EE	$28_{5,24}$-$28_{4,25}$	214357.312	185.7	14.17	...	...	"
tEME-AE	$28_{5,24}$-$28_{4,25}$	214357.333	185.7	13.93	...	...	"
tEME-EA	$28_{5,24}$-$28_{4,25}$	214361.091	185.7	14.69	...	...	CH_3OCH_3
tEME-AA	$28_{5,24}$-$28_{4,25}$	214361.527	185.7	14.72	...	...	"
tEME-EE	$26_{5,21}$-$26_{4,22}$	214369.161	164.4	11.92	...	...	CH_3COOCH_3
tEME-AE	$26_{5,21}$-$26_{4,22}$	214370.185	164.4	11.47	...	...	"
tEME-EE'	$26_{5,21}$-$26_{4,22}$	214370.456	164.4	11.08	...	...	"
tEME-EA	$26_{5,21}$-$26_{4,22}$	214370.843	164.4	13.42	...	...	"
tEME-AA	$26_{5,21}$-$26_{4,22}$	214371.154	164.4	13.55	...	...	"
tEME-EE'	$27_{5,23}$-$27_{4,24}$	214507.462	174.9	12.45	214508.5	0.61	
tEME-AE	$27_{5,23}$-$27_{4,24}$	214508.414	174.9	12.79	†		
tEME-EE	$27_{5,23}$-$27_{4,24}$	214508.510	174.9	13.14	†		
tEME-EA	$27_{5,23}$-$27_{4,24}$	214512.591	174.9	14.06	...	...	CH_3OCOH v_t=1
tEME-AA	$27_{5,23}$-$27_{4,24}$	214513.051	174.9	14.13	...	...	"
tEME-EE	$25_{5,20}$-$25_{4,21}$	214575.213	154.4	10.56	214576.5	0.58	
tEME-AE	$25_{5,20}$-$25_{4,21}$	214576.349	154.4	10.10	†		
tEME-EA	$25_{5,20}$-$25_{4,21}$	214576.498	154.4	12.69	†		
tEME-EE'	$25_{5,20}$-$25_{4,21}$	214576.706	154.4	9.74	†		
tEME-AA	$25_{5,20}$-$25_{4,21}$	214576.769	154.4	12.96	†		
tEME-EE'	$26_{5,22}$-$26_{4,23}$	214648.535	164.4	11.08	...	...	CH_3OCOH
tEME-AE	$26_{5,22}$-$26_{4,23}$	214649.611	164.4	11.47	...	...	"
tEME-EE	$26_{5,22}$-$26_{4,23}$	214649.829	164.4	11.92	...	...	"
tEME-EA	$26_{5,22}$-$26_{4,23}$	214654.288	164.5	13.41	...	...	"
tEME-AA	$26_{5,22}$-$26_{4,23}$	214654.781	164.5	13.54	...	...	"
tEME-EE	$24_{5,19}$-$24_{4,20}$	214753.118	144.7	9.23	214754.0	0.94	
tEME-EA	$24_{5,19}$-$24_{4,20}$	214754.023	144.7	11.84	†		
tEME-AA	$24_{5,19}$-$24_{4,20}$	214754.233	144.7	12.38	†		
tEME-AE	$24_{5,19}$-$24_{4,20}$	214754.329	144.7	8.86	†		
tEME-EE'	$24_{5,19}$-$24_{4,20}$	214754.733	144.7	8.60	†		
tEME-EE'	$25_{5,21}$-$25_{4,22}$	214779.208	154.4	9.73	...	...	CH_3OCOH
tEME-AE	$25_{5,21}$-$25_{4,22}$	214780.378	154.4	10.10	...	...	"
tEME-EE	$25_{5,21}$-$25_{4,22}$	214780.701	154.4	10.56	...	...	"
tEME-EA	$25_{5,21}$-$25_{4,22}$	214785.581	154.4	12.69	...	...	"
tEME-AA	$25_{5,21}$-$25_{4,22}$	214786.123	154.4	12.96	...	...	"
tEME-EE'	$23_{5,19}$-$23_{4,19}$	214895.777	135.4	4.03	...	...	CH_3OCOH v_t=1
tEME-AE	$23_{5,19}$-$23_{4,19}$	214897.184	135.4	3.90	...	...	"
tEME-EE	$23_{5,19}$-$23_{4,19}$	214897.739	135.4	3.67	...	...	"
tEME-EE'	$24_{5,20}$-$24_{4,21}$	214899.228	144.7	8.61	...	...	"
tEME-AE	$24_{5,20}$-$24_{4,21}$	214900.454	144.7	8.87	...	...	"
tEME-EE	$24_{5,20}$-$24_{4,21}$	214900.844	144.7	9.23	...	...	"
tEME-EA	$23_{5,19}$-$23_{4,19}$	214903.639	144.7	1.05	...	...	"
tEME-EA	$24_{5,20}$-$24_{4,21}$	214906.128	144.7	11.83	214906.7	1.30	
tEME-EE	$23_{5,18}$-$23_{4,19}$	214906.260	135.4	8.13	†		
tEME-AA	$24_{5,20}$-$24_{4,21}$	214906.739	144.7	12.38	†		
tEME-EA	$23_{5,18}$-$23_{4,19}$	214906.872	135.4	10.76	†		
tEME-AA	$23_{5,18}$-$23_{4,19}$	214906.992	135.4	11.80	†		
tEME-AE	$23_{5,18}$-$23_{4,19}$	214907.507	135.4	7.91	†		
tEME-EE'	$23_{5,18}$-$23_{4,19}$	214907.507	135.4	7.77	†		
tEME-EE	$24_{5,19}$-$24_{4,21}$	214909.858	144.7	11.83	...	...	CH_3CH_2CN

Table A.1. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed frequency (MHz)	T (K)	Blends
tEME-EA	$24_{5,19}$-$24_{4,21}$	214910.548	144.7	0.55	...	...	"
tEME-AE	$24_{5,19}$-$24_{4,21}$	214911.166	144.7	3.51	...	...	"
tEME-EE'	$24_{5,19}$-$24_{4,21}$	214911.685	144.7	3.77	...	...	"
tEME-EE'	$23_{5,19}$-$23_{4,20}$	215008.545	135.4	7.77	...	...	CH_3OCOH v_t=2
tEME-AE	$23_{5,19}$-$23_{4,20}$	215009.791	135.4	7.91	...	...	"
tEME-EE	$23_{5,19}$-$23_{4,20}$	215010.209	135.4	8.13	...	...	"
tEME-EA	$23_{5,19}$-$23_{4,20}$	215015.810	135.4	10.75	215016.5	1.16	
tEME-AA	$23_{5,19}$-$23_{4,20}$	215016.519	135.4	11.80	†		
tEME-EE	$23_{5,18}$-$23_{4,20}$	215018.730	135.4	3.67	...	...	CH_3OCOD
tEME-EA	$23_{5,18}$-$23_{4,20}$	215019.043	135.4	1.05	...	...	"
tEME-AE	$23_{5,18}$-$23_{4,20}$	215020.114	135.4	3.90	...	...	"
tEME-EE'	$23_{5,18}$-$23_{4,20}$	215020.693	135.4	4.03	...	...	"
tEME-EE'	$22_{5,18}$-$22_{4,18}$	215027.250	126.6	4.02	...	...	U-line
tEME-AE	$22_{5,18}$-$22_{4,18}$	215028.719	126.6	3.99	...	...	"
tEME-EE	$22_{5,18}$-$22_{4,18}$	215029.330	126.6	4.00	...	...	"
tEME-EA	$22_{5,18}$-$22_{4,18}$	215035.544	126.6	1.78	...	...	CH_3OCOD, CH_3COOCH_3
tEME-EE	$22_{5,17}$-$22_{4,18}$	215037.639	126.6	7.33	...	...	"
tEME-EA	$22_{5,17}$-$22_{4,18}$	215038.085	126.6	9.45	...	...	"
tEME-AA	$22_{5,17}$-$22_{4,18}$	215038.089	126.6	11.23	...	...	CH_3CH_2CN
tEME-AE	$22_{5,17}$-$22_{4,18}$	215038.890	126.6	7.24	...	...	"
tEME-EE'	$22_{5,17}$-$22_{4,18}$	215039.292	126.6	7.21	...	...	"
tEME-AA	$35_{2,33}$-$34_{3,32}$	215107.148	250.8	9.27	...	...	CH_3COOCH_3, CH_3OCOH v_t=2
tEME-EA	$35_{2,33}$-$34_{3,32}$	215107.270	250.8	9.27	...	...	"
tEME-EE'	$22_{5,18}$-$22_{4,19}$	215107.270	126.6	7.21	...	...	"
tEME-AE	$22_{5,18}$-$22_{4,19}$	215108.508	126.6	7.24	...	...	"
tEME-EE	$22_{5,18}$-$22_{4,19}$	215108.923	126.6	7.33	...	...	"
tEME-AE	$35_{2,33}$-$34_{3,32}$	215109.184	250.8	9.27	...	...	"
tEME-EE	$35_{2,33}$-$34_{3,32}$	215109.306	250.8	9.27	...	...	"
tEME-EE'	$35_{2,33}$-$34_{3,32}$	215109.306	250.8	9.27	...	...	"
tEME-EA	$22_{5,18}$-$22_{4,19}$	215114.713	126.6	9.44	...	...	$CH_3O^{13}COH$
tEME-AA	$22_{5,18}$-$22_{4,19}$	215115.545	126.6	11.22	...	...	"
tEME-EE	$22_{5,17}$-$22_{4,19}$	215117.232	126.6	3.90	...	...	CH_3CH_2CN
tEME-EA	$22_{5,17}$-$22_{4,19}$	215117.254	126.6	1.78	...	...	"
tEME-AE	$22_{5,17}$-$22_{4,19}$	215118.679	126.6	3.99	...	...	"
tEME-EE'	$22_{5,17}$-$22_{4,19}$	215119.312	126.6	4.02	...	...	"
tEME-EE'	$21_{5,17}$-$21_{4,17}$	215139.474	118.0	3.75	...	...	$CH_3O^{13}COH$ v_t=1
tEME-AE	$21_{5,17}$-$21_{4,17}$	215141.013	118.0	3.82	215141.0	0.59	$CH_3O^{13}COH$ v_t=1
tEME-EE	$21_{5,17}$-$21_{4,17}$	215141.682	118.0	3.85	†		
tEME-EA	$21_{5,17}$-$21_{4,17}$	215148.139	118.0	2.58	215150.7	1.28	
tEME-EE	$21_{5,16}$-$21_{4,17}$	215149.914	118.0	6.81	†		
tEME-AA	$21_{5,16}$-$21_{4,17}$	215150.202	118.0	10.66	†		
tEME-EA	$21_{5,16}$-$21_{4,17}$	215150.327	118.0	8.07	†		
tEME-AE	$21_{5,16}$-$21_{4,17}$	215151.142	118.0	6.84	215150.7†	1.28	
tEME-EE'	$21_{5,16}$-$21_{4,17}$	215151.503	118.0	6.91	†		
tEME-EE'	$22_{5,17}$-$22_{4,18}$	215195.665	118.0	6.91	...	...	SO
tEME-AE	$22_{5,17}$-$22_{4,18}$	215196.869	118.0	6.84	...	...	"
tEME-EE	$22_{5,17}$-$22_{4,18}$	215197.254	118.0	6.81	...	...	"
tEME-EA	$22_{5,17}$-$22_{4,18}$	215203.100	118.0	8.07	...	...	"
tEME-AA	$22_{5,17}$-$22_{4,18}$	215204.068	118.0	10.66	...	...	"
tEME-EA	$22_{5,16}$-$22_{4,18}$	215205.287	118.0	2.58	...	...	"
tEME-EE	$22_{5,16}$-$22_{4,18}$	215205.486	118.0	3.84	...	...	"
tEME-AE	$22_{5,16}$-$22_{4,18}$	215206.998	118.0	3.82	...	...	"
tEME-EE'	$22_{5,16}$-$22_{4,18}$	215207.694	118.0	3.75	...	...	"
tEME-EE'	$20_{5,16}$-$20_{4,16}$	215234.851	109.9	3.26	...	...	"
tEME-AE	$20_{5,16}$-$20_{4,16}$	215236.480	109.9	3.41	...	...	"
tEME-EE	$20_{5,16}$-$20_{4,16}$	215237.223	109.9	3.55	...	...	"
tEME-EA	$20_{5,16}$-$20_{4,16}$	215243.901	109.9	3.19	...	...	CH_3COOCH_3 $CH_3O^{13}COH$, CH_3CH_2CN v_{13}/v_{21}
tEME-EE	$20_{5,15}$-$20_{4,16}$	215245.438	109.9	6.54	...	...	"
tEME-AA	$20_{5,15}$-$20_{4,16}$	215245.691	109.9	10.09	...	...	"
tEME-EA	$20_{5,15}$-$20_{4,16}$	215245.934	109.9	6.89	...	...	"
tEME-AE	$20_{5,15}$-$20_{4,16}$	215246.615	109.9	6.67	...	...	"
tEME-EE'	$20_{5,15}$-$20_{4,16}$	215246.907	109.9	6.83	...	...	"
tEME-EE'	$20_{5,16}$-$20_{4,17}$	215274.126	109.9	6.83	...	...	CH_3COOCH_3, U-line
tEME-AE	$20_{5,16}$-$20_{4,17}$	215275.268	109.9	6.67	...	...	"
tEME-EE	$20_{5,16}$-$20_{4,17}$	215275.595	109.9	6.54	...	...	"
tEME-EA	$20_{5,16}$-$20_{4,17}$	215281.378	109.9	6.89	...	...	U-line
tEME-AA	$20_{5,16}$-$20_{4,17}$	215282.470	109.9	10.09	...	...	"
tEME-EA	$20_{5,15}$-$20_{4,17}$	215283.411	109.9	3.19	...	...	"
tEME-EE	$20_{5,15}$-$20_{4,17}$	215283.810	109.9	3.55	...	...	"
tEME-AE	$20_{5,15}$-$20_{4,17}$	215285.403	109.9	3.41	...	...	"
tEME-EE'	$20_{5,15}$-$20_{4,17}$	215286.182	109.9	3.26	...	...	"
tEME-EE'	$19_{5,15}$-$19_{4,15}$	215315.464	102.2	2.57	...	...	U-line
tEME-AE	$19_{5,15}$-$19_{4,15}$	215317.213	102.2	2.79	215317.4	0.54	U-line
tEME-EE	$19_{5,15}$-$19_{4,15}$	215318.057	102.2	3.02	†		
tEME-EA	$19_{5,15}$-$19_{4,15}$	215324.992	102.2	3.49	215327.2	1.96	$^{13}CH_3OCOH$ v_t=1
tEME-EE	$19_{5,14}$-$19_{4,15}$	215326.280	102.2	6.50	†		
tEME-AA	$19_{5,14}$-$19_{4,15}$	215326.637	102.2	9.52	†		
tEME-EA	$19_{5,14}$-$19_{4,15}$	215326.971	102.2	6.03	†		
tEME-AE	$19_{5,14}$-$19_{4,15}$	215327.373	102.2	6.72	†		
tEME-EE'	$19_{5,14}$-$19_{4,15}$	215327.561	102.2	6.95	†		
tEME-EE'	$19_{5,15}$-$19_{4,16}$	215343.169	102.2	6.95	...	...	CH_3OCOH
tEME-AE	$19_{5,15}$-$19_{4,16}$	215344.214	102.2	6.72	...	...	"

Table A.1. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed frequency (MHz)	T (K)	Blends
tEME-EE	$19_{5,15}$-$19_{4,16}$	215344.450	102.2	6.50	...	....	"
tEME-EA	$19_{5,15}$-$19_{4,16}$	215350.059	102.2	6.03	215351.2	0.91	CH_3CH_2CN (v=0, v_{13}/v_{21})
tEME-AA	$19_{5,15}$-$19_{4,16}$	215351.248	102.2	9.52	†		
tEME-EA	$19_{5,14}$-$19_{4,16}$	215352.037	102.2	3.49	†		
tEME-EE	$19_{5,14}$-$19_{4,16}$	215352.674	102.2	3.02	†		
tEME-AE	$19_{5,14}$-$19_{4,16}$	215354.374	102.2	2.79	...	...	CH_3CH_2CN (v=0, v_{13}/v_{21})
tEME-EE’	$19_{5,14}$-$19_{4,16}$	215355.266	102.2	2.57	...	...	"
tEME-EE’	$12_{3,10}$-$11_{2,9}$	215361.252	40.5	4.16	215361.7	0.43	
tEME-EE	$12_{3,10}$-$11_{2,9}$	215361.484	40.5	4.18	†		
tEME-AE	$12_{3,10}$-$11_{2,9}$	215361.676	40.5	4.17	†		
tEME-EA	$12_{3,10}$-$11_{2,9}$	215364.224	40.5	4.19	...	...	CH_3CH_2OH
tEME-AA	$12_{3,10}$-$11_{2,9}$	215364.533	40.5	4.20	...	...	"
tEME-EA	$18_{5,14}$-$18_{4,14}$	215393.299	94.8	3.48	215395.5	1.01	
tEME-EE	$18_{5,13}$-$18_{4,14}$	215394.256	94.8	6.65	†		
tEME-AA	$18_{5,13}$-$18_{4,14}$	215394.875	94.8	8.95	†		
tEME-AE	$18_{5,13}$-$18_{4,14}$	215395.227	94.8	6.94	†		
tEME-EA	$18_{5,13}$-$18_{4,14}$	215395.264	94.8	5.47	†		
tEME-EE’	$18_{5,13}$-$18_{4,14}$	215395.280	94.8	7.19	†		
tEME-EE’	$18_{5,14}$-$18_{4,15}$	215403.394	94.8	7.19	215404.5	0.91	
tEME-AE	$18_{5,14}$-$18_{4,15}$	215404.308	94.8	6.94	†		
tEME-EE	$18_{5,14}$-$18_{4,15}$	215404.417	94.8	6.65	†		
tEME-EA	$18_{5,14}$-$18_{4,15}$	215409.728	94.8	5.47	215411.2	0.59	
tEME-AA	$18_{5,14}$-$18_{4,15}$	215410.979	94.8	8.95	†		
tEME-EA	$18_{5,14}$-$18_{4,15}$	215411.693	94.8	3.48	†		
tEME-EE	$18_{5,14}$-$18_{4,15}$	215412.657	94.8	2.31	†		
tEME-EA	$17_{5,13}$-$17_{4,13}$	215450.467	87.9	3.22	215451.7	1.65	
tEME-EE	$17_{5,12}$-$17_{4,13}$	215450.974	87.9	6.90	†		
tEME-EE’	$17_{5,12}$-$17_{4,13}$	215451.703	87.9	7.39	†		
tEME-AE	$17_{5,12}$-$17_{4,13}$	215451.799	87.9	7.18	†		
tEME-AA	$17_{5,12}$-$17_{4,13}$	215452.025	87.9	8.39	†		
tEME-EA	$17_{5,12}$-$17_{4,13}$	215452.436	87.9	5.17	†		
tEME-EE’	$17_{5,13}$-$17_{4,13}$	215455.422	87.9	7.39	215456.2	1.60	$^{13}CH_3OCOH$ v_t=1
tEME-EE	$17_{5,13}$-$17_{4,13}$	215456.151	87.9	6.90	†		
tEME-AE	$17_{5,13}$-$17_{4,13}$	215456.193	87.9	7.18	†		
tEME-EA	$17_{5,13}$-$17_{4,14}$	215461.025	87.9	5.17	215462.2	1.81	U-line
tEME-AA	$17_{5,13}$-$17_{4,14}$	215462.304	87.9	8.39	†		
tEME-EA	$17_{5,12}$-$17_{4,14}$	215462.994	87.9	3.22	†		
tEME-EE’	$27_{1,27}$-$26_{0,26}$	215478.840	144.2	21.60	215479.5	1.81	
tEME-EE	$27_{1,27}$-$26_{0,26}$	215478.840	144.2	21.60	†		
tEME-AE	$27_{1,27}$-$26_{0,26}$	215478.854	144.2	21.60	†		
tEME-EA	$27_{1,27}$-$26_{0,26}$	215479.025	144.2	21.60	†		
tEME-AA	$27_{1,27}$-$26_{0,26}$	215479.039	144.2	21.60	†		
tEME-EE	$16_{5,11}$-$16_{4,12}$	215497.897	81.3	7.05	215498.7	1.96	CH_3CH_2CN v_{13}/v_{21}
tEME-EA	$16_{5,12}$-$16_{4,12}$	215497.943	81.3	2.74	†		
tEME-EE’	$16_{5,11}$-$16_{4,12}$	215498.372	81.3	7.37	†		
tEME-AE	$16_{5,11}$-$16_{4,12}$	215498.590	81.3	7.23	†		
tEME-AA	$16_{5,11}$-$16_{4,12}$	215499.524	81.3	7.82	215500.2 †	1.22	
tEME-EE’	$16_{5,12}$-$16_{4,13}$	215499.830	81.3	7.37	†		
tEME-EA	$16_{5,11}$-$16_{4,12}$	215499.921	81.3	5.08	†		
tEME-EE	$16_{5,12}$-$16_{4,13}$	215500.305	81.3	7.05	†		
tEME-AE	$16_{5,12}$-$16_{4,13}$	215500.485	81.3	7.24	†		
tEME-EA	$16_{5,12}$-$16_{4,13}$	215504.636	81.3	5.08	215506.2	1.22	$CH_3C^{13}CH$
tEME-AA	$16_{5,12}$-$16_{4,13}$	215505.905	81.3	7.82	†		
tEME-EA	$16_{5,11}$-$16_{4,13}$	215506.613	81.3	2.74	†		
tEME-EE	$15_{5,10}$-$15_{4,11}$	215536.404	75.1	6.94	215537.7	1.33	
tEME-EE’	$15_{5,10}$-$15_{4,11}$	215536.720	75.1	7.08	†		
tEME-EA	$15_{5,11}$-$15_{4,11}$	215537.002	75.1	2.05	†		
tEME-AE	$15_{5,10}$-$15_{4,11}$	215537.010	75.1	7.03	†		
tEME-EE’	$15_{5,11}$-$15_{4,12}$	215537.169	75.1	7.08	†		
tEME-EE	$15_{5,11}$-$15_{4,12}$	215537.485	75.1	6.94	†		
tEME-AE	$15_{5,11}$-$15_{4,12}$	215537.757	75.1	7.08	†		
tEME-AA	$15_{5,10}$-$15_{4,11}$	215538.650	75.1	7.25	†		
tEME-EA	$15_{5,10}$-$15_{4,11}$	215538.990	75.1	5.21	†		
tEME-EA	$15_{5,11}$-$15_{4,12}$	215541.270	75.1	5.21	215541.5 †	1.06	CH_3COOCH_3
tEME-AA	$15_{5,11}$-$15_{4,12}$	215542.488	75.1	7.25	†		
tEME-EA	$15_{5,10}$-$15_{4,12}$	215543.258	75.1	2.05	†		
tEME-EE	$14_{5,9}$-$14_{4,10}$	215567.750	69.3	6.58	215567.9	2.13	
tEME-EE’	$14_{5,9}$-$14_{4,10}$	215567.993	69.3	6.63	†		
tEME-EE’	$14_{5,10}$-$14_{4,11}$	215568.043	69.3	6.63	†		
tEME-EE	$14_{5,10}$-$14_{4,11}$	215568.286	69.3	6.58	†		
tEME-AE	$14_{5,9}$-$14_{4,10}$	215568.316	69.3	6.61	†		
tEME-AE	$14_{5,10}$-$14_{4,11}$	215568.602	69.3	6.61	215571.7	1.89	CH_3OCOH v_t=1
tEME-AE	$14_{5,10}$-$14_{4,10}$	215568.774	69.3	1.23	†		
tEME-AA	$14_{5,9}$-$14_{4,10}$	215570.539	69.3	6.68	†		
tEME-EA	$14_{5,9}$-$14_{4,10}$	215570.772	69.3	5.45	†		
tEME-EA	$14_{5,10}$-$14_{4,11}$	215571.650	69.3	5.45	†		
tEME-AA	$14_{5,10}$-$14_{4,11}$	215572.766	69.3	6.68	†		
tEME-EA	$14_{5,9}$-$14_{4,11}$	215573.648	69.3	1.23	†		
tEME-EE	$13_{5,8}$-$13_{4,9}$	215593.014	63.9	6.08	215593.5	1.41	
tEME-EE’	$13_{5,9}$-$13_{4,10}$	215593.138	63.9	6.09	†		
tEME-EE’	$13_{5,8}$-$13_{4,9}$	215593.228	63.9	6.09	†		
tEME-EE	$13_{5,9}$-$13_{4,10}$	215593.353	63.9	6.08	†		
tEME-AE	$13_{5,8}$-$13_{4,9}$	215593.566	63.9	6.09	†		

Table A.1. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed frequency (MHz)	T (K)	Blends
tEME-AE	$13_{5,9}$-$13_{4,10}$	215593.687	63.9	6.09	†		
tEME-EA	$13_{5,9}$-$13_{4,9}$	215594.282	63.9	0.53	†		
tEME-AA	$13_{5,8}$-$13_{4,9}$	215596.207	63.9	6.11	215596.5	1.12	
tEME-EA	$13_{5,8}$-$13_{4,9}$	215596.289	63.9	5.58	†		
tEME-EA	$13_{5,9}$-$13_{4,10}$	215596.478	63.9	5.58	†		
tEME-AA	$13_{5,9}$-$13_{4,10}$	215597.447	63.9	6.11	†		
tEME-EA	$13_{5,8}$-$13_{4,10}$	215598.486	63.9	0.53	†		
tEME-EE	$12_{5,7}$-$12_{4,8}$	215613.102	58.9	5.52	215613.7	1.89	
tEME-EE'	$12_{5,8}$-$12_{4,9}$	215613.172	58.9	5.53	†		
tEME-EE'	$12_{5,7}$-$12_{4,8}$	215613.308	58.9	5.53	†		
tEME-EE	$12_{5,8}$-$12_{4,9}$	215613.378	58.9	5.52	†		
tEME-AE	$12_{5,7}$-$12_{4,8}$	215613.651	58.9	5.52	†		
tEME-AE	$12_{5,8}$-$12_{4,9}$	215613.720	58.9	5.52	†		
tEME-EA	$12_{5,8}$-$12_{4,9}$	215616.405	58.9	5.37	...	...	$^{13}CH_3OCOH$ v_t=1, CH_3CH_2CN
tEME-EA	$12_{5,7}$-$12_{4,8}$	215616.490	58.9	5.37	...	...	"
tEME-AA	$12_{5,7}$-$12_{4,8}$	215616.564	58.9	5.53	...	...	"
tEME-AA	$12_{5,8}$-$12_{4,9}$	215617.221	58.9	5.53	...	...	"
tEME-EE	$11_{5,6}$-$11_{4,7}$	215628.800	54.3	4.94	215629.7	1.60	
tEME-EE'	$11_{5,7}$-$11_{4,8}$	215628.855	54.3	4.94	†		
tEME-EE'	$11_{5,6}$-$11_{4,7}$	215629.003	54.3	4.94	†		
tEME-EE	$11_{5,7}$-$11_{4,8}$	215629.058	54.3	4.94	†		
tEME-AE	$11_{5,6}$-$11_{4,7}$	215629.349	54.3	4.94	†		
tEME-AE	$11_{5,7}$-$11_{4,8}$	215629.404	54.3	4.94	†		
tEME-EA	$11_{5,7}$-$11_{4,8}$	215632.056	54.3	4.91	215632.7	1.06	
tEME-EA	$11_{5,6}$-$11_{4,7}$	215632.229	54.3	4.91	†		
tEME-AA	$11_{5,6}$-$11_{4,7}$	215632.425	54.3	4.94	†		
tEME-AA	$11_{5,7}$-$11_{4,8}$	215632.754	54.3	4.94	†		
tEME-EE	$10_{5,5}$-$10_{4,6}$	215640.803	50.0	4.35	215641.1	1.31	
tEME-EE'	$10_{5,6}$-$10_{4,7}$	215640.854	50.0	4.35	†		
tEME-EE'	$10_{5,5}$-$10_{4,6}$	215641.007	50.0	4.35	†		
tEME-EE	$10_{5,6}$-$10_{4,7}$	215641.058	50.0	4.35	†		
tEME-AE	$10_{5,5}$-$10_{4,6}$	215641.354	50.0	4.35	†		
tEME-AE	$10_{5,6}$-$10_{4,7}$	215641.405	50.0	4.35	†		
tEME-EA	$10_{5,6}$-$10_{4,7}$	215644.051	50.0	4.34	215644.1	1.26	$^{13}CH_3OCOH$ v_t=1
tEME-EA	$10_{5,5}$-$10_{4,6}$	215644.248	50.0	4.34	†		
tEME-AA	$10_{5,5}$-$10_{4,6}$	215644.522	50.0	4.35	†		
tEME-AA	$10_{5,6}$-$10_{4,7}$	215644.676	50.0	4.35	†		
tEME-EE	$9_{5,4}$-$9_{4,5}$	215649.740	46.1	3.73	215650.2	1.02	
tEME-EE'	$9_{5,5}$-$9_{4,6}$	215649.791	46.1	3.73	†		
tEME-EE'	$9_{5,4}$-$9_{4,5}$	215649.944	46.1	3.73	†		
tEME-EE	$9_{5,5}$-$9_{4,6}$	215649.995	46.1	3.73	†		
tEME-AE	$9_{5,4}$-$9_{4,5}$	215650.292	46.1	3.73	†		
tEME-AE	$9_{5,5}$-$9_{4,6}$	215650.343	46.1	3.73	†		
tEME-EA	$9_{5,5}$-$9_{4,6}$	215652.990	46.1	3.73	215653.2	0.92	
tEME-EA	$9_{5,4}$-$9_{4,5}$	215653.193	46.1	3.73	†		
tEME-AA	$9_{5,4}$-$9_{4,5}$	215653.509	46.1	3.73	†		
tEME-AA	$9_{5,5}$-$9_{4,6}$	215653.575	46.1	3.73	†		
tEME-EE	$8_{5,3}$-$8_{4,4}$	215656.176	42.7	3.10	215656.2	1.16	
tEME-EE'	$8_{5,4}$-$8_{4,5}$	215656.227	42.7	3.10	†		
tEME-EE'	$8_{5,3}$-$8_{4,4}$	215656.380	42.7	3.10	†		
tEME-EE	$8_{5,4}$-$8_{4,5}$	215656.432	42.7	3.10	†		
tEME-AE	$8_{5,3}$-$8_{4,4}$	215656.730	42.7	3.10	†		
tEME-AE	$8_{5,4}$-$8_{4,5}$	215656.781	42.7	3.10	†		
tEME-EA	$8_{5,4}$-$8_{4,5}$	215659.431	42.7	3.10	215660.8	1.16	
tEME-EA	$8_{5,3}$-$8_{4,4}$	215659.635	42.7	3.10	†		
tEME-AA	$8_{5,3}$-$8_{4,4}$	215659.972	42.7	3.10	†		
tEME-AA	$8_{5,4}$-$8_{4,5}$	215659.998	42.7	3.10	†		
tEME-EE	$7_{5,2}$-$7_{4,3}$	215660.620	39.6	2.43	†		
tEME-EE'	$7_{5,3}$-$7_{4,4}$	215660.672	39.6	2.43	†		
tEME-EE'	$7_{5,2}$-$7_{4,3}$	215660.825	39.6	2.43	†		
tEME-EE	$7_{5,3}$-$7_{4,4}$	215660.877	39.6	2.43	†		
tEME-AE	$7_{5,2}$-$7_{4,3}$	215661.175	39.6	2.43	†		
tEME-AE	$7_{5,3}$-$7_{4,4}$	215661.227	39.6	2.43	†		
tEME-EE	$6_{5,1}$-$6_{4,2}$	215663.523	36.9	1.72	215664.6	1.11	
tEME-EE'	$6_{5,2}$-$6_{4,3}$	215663.575	36.9	1.72	†		
tEME-EE'	$6_{5,1}$-$6_{4,2}$	215663.728	36.9	1.72	†		
tEME-EE	$6_{5,2}$-$6_{4,3}$	215663.780	36.9	1.72	†		
tEME-EA	$7_{5,3}$-$7_{4,4}$	215663.879	39.6	2.43	†		
tEME-AE	$6_{5,1}$-$6_{4,2}$	215664.080	36.9	1.72	†		
tEME-EA	$7_{5,2}$-$7_{4,3}$	215664.084	39.6	2.43	†		
tEME-AE	$6_{5,2}$-$6_{4,3}$	215664.131	36.9	1.72	†		
tEME-AA	$7_{5,2}$-$7_{4,3}$	215664.430	39.6	2.43	†		
tEME-AA	$7_{5,3}$-$7_{4,4}$	215664.439	39.6	2.43	†		
tEME-EE	$5_{5,0}$-$5_{4,1}$	215665.279	34.6	0.92	†		
tEME-EE'	$5_{5,1}$-$5_{4,2}$	215665.331	34.6	0.92	†		
tEME-EE'	$5_{5,0}$-$5_{4,1}$	215665.485	34.6	0.92	†		
tEME-EE	$5_{5,1}$-$5_{4,2}$	215665.537	34.6	0.92	†		
tEME-AE	$5_{5,0}$-$5_{4,1}$	215665.837	34.6	0.92	†		
tEME-AE	$5_{5,1}$-$5_{4,2}$	215665.889	34.6	0.92	†		
tEME-EA	$6_{5,2}$-$6_{4,3}$	215666.786	36.9	1.72	215667.6	0.97	CH_3CH_2CN
tEME-AE	$6_{5,1}$-$6_{4,2}$	215666.991	36.9	1.72	†		
tEME-AE	$6_{5,1}$-$6_{4,2}$	215667.342	36.9	1.72	†		
tEME-EA	$6_{5,2}$-$6_{4,3}$	215667.344	36.9	1.72	†		

Table A.1. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed frequency (MHz)	T (K)	Blends
tEME-AE	$5_{5,1}$-$5_{4,2}$	215668.545	34.6	0.92	†		
tEME-AA	$5_{5,0}$-$5_{4,1}$	215668.751	34.6	0.92	†		
tEME-AA	$5_{5,0}$-$5_{4,1}$	215669.103	34.6	0.92	†		
tEME-AE	$5_{5,1}$-$5_{4,2}$	215669.103	34.6	0.92	†		
tEME-EE’	$6_{4,3}$-$5_{3,3}$	216054.535	26.5	3.73	216056.4	0.95	
tEME-EE	$6_{4,3}$-$5_{3,3}$	216054.868	26.5	3.73	†		
tEME-AE	$6_{4,3}$-$5_{3,3}$	216055.095	26.5	3.73	†		
tEME-EE	$6_{4,2}$-$5_{3,2}$	216055.759	26.5	3.73	†		
tEME-EE’	$6_{4,2}$-$5_{3,2}$	216056.093	26.5	3.73	†		
tEME-AE	$6_{4,2}$-$5_{3,2}$	216056.319	26.5	3.73	†		
tEME-EA	$6_{4,3}$-$5_{3,3}$	216058.222	26.5	3.69	216059.3 †	1.14	
tEME-EA	$6_{4,2}$-$5_{3,2}$	216058.519	26.5	3.69	†		
tEME-AA	$6_{4,3}$-$5_{3,2}$	216058.597	26.5	3.73	†		
tEME-AA	$6_{4,2}$-$5_{3,3}$	216058.930	26.5	3.73	†		
tEME-EE	$12_{3,9}$-$11_{2,10}$	217007.530	40.5	4.14	217007.6	0.49	
tEME-EE’	$12_{3,9}$-$11_{2,10}$	217007.763	40.5	4.12	†		
tEME-AE	$12_{3,9}$-$11_{2,10}$	217007.939	40.5	4.13	†		
tEME-EA	$12_{3,9}$-$11_{2,10}$	217009.762	40.5	4.16	217010.6	0.54	
tEME-AA	$12_{3,9}$-$11_{2,10}$	217010.054	40.5	4.16	†		
tEME-AA	$30_{1,29}$-$29_{2,28}$	217164.465	182.5	13.55	217165.1	2.68	CH_3OCOH
tEME-EA	$30_{1,29}$-$29_{2,28}$	217164.508	182.5	13.55	†		
tEME-AE	$30_{1,29}$-$29_{2,28}$	217165.360	182.5	13.55	†		
tEME-EE	$30_{1,29}$-$29_{2,28}$	217165.402	182.5	13.55	†		
tEME-EE’	$30_{1,29}$-$29_{2,28}$	217165.402	182.5	13.55	†		
tEME-AA	$28_{0,28}$-$27_{1,27}$	217940.650	154.7	22.59	217940.7	1.46	
tEME-EA	$28_{0,28}$-$27_{1,27}$	217940.651	154.7	22.59	†		
tEME-AE	$28_{0,28}$-$27_{1,27}$	217940.758	154.7	22.59	†		
tEME-EE	$28_{0,28}$-$27_{1,27}$	217940.759	154.7	22.59	†		
tEME-EE’	$28_{0,28}$-$27_{1,27}$	217940.759	154.7	22.59	†		
tEME-EE’	$22_{2,21}$-$21_{1,20}$	219893.140	102.2	8.31	219893.0	0.86	
tEME-EE	$22_{2,21}$-$21_{1,20}$	219893.140	102.2	8.31	†		
tEME-AE	$22_{2,21}$-$21_{1,20}$	219893.263	102.2	8.31	†		
tEME-EA	$22_{2,21}$-$21_{1,20}$	219894.511	102.2	8.31	219894.5†	0.66	
tEME-AA	$22_{2,21}$-$21_{1,20}$	219894.635	102.2	8.31	†		
tEME-EE’	$28_{1,28}$-$27_{0,27}$	222861.487	154.8	22.63	222861.2	3.06	CH_3OCHO
tEME-EE	$28_{1,28}$-$27_{0,27}$	222861.487	154.8	22.63	†		
tEME-AE	$28_{1,28}$-$27_{0,27}$	222861.500	154.8	22.63	†		
tEME-EA	$28_{1,28}$-$27_{0,27}$	222861.655	154.8	22.63	†		
tEME-AA	$28_{1,28}$-$27_{0,27}$	222861.668	154.8	22.63	†		
tEME-EE’	$13_{3,11}$-$12_{2,10}$	222980.574	45.5	4.38	...	...	$CH_3O^{13}COH$
tEME-EE	$13_{3,11}$-$12_{2,10}$	222980.720	45.5	4.39	...	...	"
tEME-AE	$13_{3,11}$-$12_{2,10}$	222980.951	45.5	4.39	...	...	"
tEME-EA	$13_{3,11}$-$12_{2,10}$	222983.368	45.5	4.40	...	...	"
tEME-AA	$13_{3,11}$-$12_{2,10}$	222983.672	45.5	4.40	...	...	"
tEME-EE	$16_{2,14}$-$15_{1,15}$	223403.761	57.4	2.48	223403.5	0.82	CH_3OCH_3
tEME-EE’	$16_{2,14}$-$15_{1,15}$	223403.762	57.4	2.48	†		
tEME-AE	$16_{2,14}$-$15_{1,15}$	223404.001	57.4	2.48	†		
tEME-EA	$16_{2,14}$-$15_{1,15}$	223405.432	57.4	2.48	...	...	CH_3OCH_3
tEME-AA	$16_{2,14}$-$15_{1,15}$	223405.671	57.4	2.48	...	...	
tEME-EE’	$7_{4,4}$-$6_{3,4}$	224103.753	29.2	3.89	224104.2	1.49	
tEME-EE	$7_{4,4}$-$6_{3,4}$	224104.093	29.2	3.88	†		
tEME-AE	$7_{4,4}$-$6_{3,4}$	224104.315	29.2	3.89	†		
tEME-EE	$7_{4,3}$-$6_{3,3}$	224104.926	29.2	3.88	†		
tEME-EE’	$7_{4,3}$-$6_{3,3}$	224105.266	29.2	3.89	†		
tEME-AE	$7_{4,3}$-$6_{3,3}$	224105.490	29.2	3.89	†		
tEME-AA	$7_{4,4}$-$6_{3,3}$	224107.456	29.2	3.90	224108.0 †	1.12	
tEME-EA	$7_{4,4}$-$6_{3,4}$	224107.546	29.2	3.58	†		
tEME-EA	$7_{4,3}$-$6_{3,3}$	224107.581	29.2	3.58	†		
tEME-AA	$7_{4,3}$-$6_{3,4}$	224108.457	29.2	3.90	†		
tEME-EE	$13_{3,10}$-$12_{2,11}$	225283.674	45.5	4.33	225283.2	1.41	CH_3CH_2OH
tEME-EE’	$13_{3,10}$-$12_{2,11}$	225283.820	45.5	4.33	†		
tEME-AE	$13_{3,10}$-$12_{2,11}$	225284.043	45.5	4.33	†		
tEME-EA	$13_{3,10}$-$12_{2,11}$	225285.990	45.5	4.34	†		
tEME-AA	$13_{3,10}$-$12_{2,11}$	225286.286	45.5	4.34	†		
tEME-EE’	$23_{2,22}$-$22_{1,21}$	225494.508	111.0	8.90	225494.6	0.72	
tEME-EE	$23_{2,22}$-$22_{1,21}$	225494.508	111.0	8.90	†		
tEME-AE	$23_{2,22}$-$22_{1,21}$	225494.625	111.0	8.90	†		
tEME-EA	$23_{2,22}$-$22_{1,21}$	225495.848	111.0	8.90	†		
tEME-AA	$23_{2,22}$-$22_{1,21}$	225495.965	111.0	8.90	†		
tEME-EA	$29_{0,29}$-$28_{1,28}$	226057.836	165.7	23.62	226058.4	3.50	CH_3CH_2OH
tEME-AA	$29_{0,29}$-$28_{1,28}$	226057.836	165.7	23.62	†		
tEME-EE	$29_{0,29}$-$28_{1,28}$	226057.928	165.7	23.62	†		
tEME-EE’	$29_{0,29}$-$28_{1,28}$	226057.928	165.7	23.62	†		
tEME-AE	$29_{0,29}$-$28_{1,28}$	226057.928	165.7	23.62	†		
tEME-AA	$31_{1,30}$-$30_{2,29}$	227090.552	194.5	14.51	...	...	CH_3OH
tEME-EA	$31_{1,30}$-$30_{2,29}$	227090.589	194.5	14.51	...	...	"
tEME-AE	$31_{1,30}$-$30_{2,29}$	227091.390	194.5	14.51	...	...	"
tEME-EE	$31_{1,30}$-$30_{2,29}$	227091.426	194.5	14.51	...	...	"
tEME-EE’	$31_{1,30}$-$30_{2,29}$	227091.426	194.5	14.51	...	...	"
tEME-EE’	$29_{1,29}$-$28_{0,28}$	230291.194	165.8	23.66	...	...	CH_3OH, CH_3OCOH
tEME-EE	$29_{1,29}$-$28_{0,28}$	230291.194	165.8	23.66	...	...	"
tEME-AE	$29_{1,29}$-$28_{0,28}$	230291.205	165.8	23.66	...	...	"
tEME-EA	$29_{1,29}$-$28_{0,28}$	230291.345	165.8	23.66	...	...	"

Table A.1. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed frequency (MHz)	T (K)	Blends
tEME-AA	$29_{1,29}$-$28_{0,28}$	230291.357	165.8	23.66	...	...	"
tEME-EE’	$14_{3,12}$-$13_{2,11}$	230486.881	50.9	4.59	230487.1	0.58	CO
tEME-EE	$14_{3,12}$-$13_{2,11}$	230486.975	50.9	4.59	†		
tEME-AE	$14_{3,12}$-$13_{2,11}$	230487.227	50.9	4.59	†		
tEME-EA	$14_{3,12}$-$13_{2,11}$	230489.569	50.9	4.59	...	...	CO
tEME-AA	$14_{3,12}$-$13_{2,11}$	230489.869	50.9	4.59	...	...	"
tEME-EE’	$24_{2,23}$-$23_{1,22}$	231063.540	120.2	9.52	...	...	OCS
tEME-EE	$24_{2,23}$-$23_{1,22}$	231063.540	120.2	9.52	...	...	"
tEME-AE	$24_{2,23}$-$23_{1,22}$	231063.652	120.2	9.52	...	...	"
tEME-EA	$24_{2,23}$-$23_{1,22}$	231064.846	120.2	9.52	...	...	"
tEME-EA	$24_{2,23}$-$23_{1,22}$	231064.958	120.2	9.52	...	...	"
tEME-EE’	$8_{4,5}$-$7_{3,5}$	232151.207	32.3	4.03	232151.8	1.16	
tEME-EE	$8_{4,5}$-$7_{3,5}$	232151.590	32.3	3.98	†		
tEME-AE	$8_{4,5}$-$7_{3,5}$	232151.787	32.3	4.01	†		
tEME-EE	$8_{4,4}$-$7_{3,4}$	232152.098	32.3	3.98	†		
tEME-EE’	$8_{4,4}$-$7_{3,4}$	232152.480	32.3	4.03	†		
tEME-EA	$8_{4,5}$-$7_{3,4}$	232152.521	32.3	1.00	†		
tEME-AE	$8_{4,4}$-$7_{3,4}$	232152.685	32.3	4.01	†		
tEME-AA	$8_{4,5}$-$7_{3,4}$	232154.033	32.3	4.08	†		
tEME-EA	$8_{4,4}$-$7_{3,4}$	232154.362	32.3	3.08	†		
tEME-EA	$8_{4,5}$-$7_{3,5}$	232155.426	32.3	3.08	†		
tEME-AA	$8_{4,4}$-$7_{3,5}$	232156.540	32.3	4.08	...	...	CH_3OCOH v_t=1
tEME-EA	$8_{4,4}$-$7_{3,5}$	232157.268	32.3	1.00	...	...	"
tEME-EE	$14_{3,11}$-$13_{2,12}$	233622.462	51.0	4.51	233622.5	2.10	CH_3CH_2CN v_{13}/v_{21}
tEME-EE’	$14_{3,11}$-$13_{2,12}$	233622.556	51.0	4.51	†		
tEME-AE	$14_{3,11}$-$13_{2,12}$	233622.806	51.0	4.51	†		
tEME-EA	$14_{3,11}$-$13_{2,12}$	233624.824	51.0	4.51	...	...	CH_3OCOH v_t=0,1
tEME-AA	$14_{3,11}$-$13_{2,12}$	233625.121	51.0	4.51	...	...	"
tEME-EA	$30_{0,30}$-$29_{1,29}$	234130.523	177.0	24.66	...	...	CH_3OCOH
tEME-AA	$30_{0,30}$-$29_{1,29}$	234130.524	177.0	24.66	...	...	"
tEME-EE	$30_{0,30}$-$29_{1,29}$	234130.601	177.0	24.66	...	...	"
tEME-EE’	$30_{0,30}$-$29_{1,29}$	234130.601	177.0	24.66	...	...	"
tEME-AE	$30_{0,30}$-$29_{1,29}$	234130.602	177.0	24.66	...	...	"
tEME-EE	$17_{2,15}$-$16_{1,16}$	235247.484	64.0	2.37	235247.5	0.49	U-line
tEME-EE’	$17_{2,15}$-$16_{1,16}$	235247.485	64.0	2.37	†		
tEME-AE	$17_{2,15}$-$16_{1,16}$	235247.731	64.0	2.37	†		
tEME-EA	$17_{2,15}$-$16_{1,16}$	235249.156	64.0	2.37	235249.6	0.41	U-line
tEME-AA	$17_{2,15}$-$16_{1,16}$	235249.403	64.0	2.37	†		
tEME-EE’	$25_{2,24}$-$24_{1,23}$	236614.358	129.8	10.19	236614.8	1.89	$CH_3O^{13}COH$ v_t=1
tEME-EE	$25_{2,24}$-$24_{1,23}$	236614.358	129.8	10.19	†		
tEME-AE	$25_{2,24}$-$24_{1,23}$	236614.464	129.8	10.19	†		
tEME-EA	$25_{2,24}$-$24_{1,23}$	236615.628	129.8	10.19	†		
tEME-AA	$25_{2,24}$-$24_{1,23}$	236615.733	129.8	10.19	†		
tEME-AA	$32_{1,31}$-$31_{2,30}$	236906.877	206.9	15.50	236907.6	0.99	
tEME-EA	$32_{1,31}$-$31_{2,30}$	236906.908	206.9	15.50	†		
tEME-AE	$32_{1,31}$-$31_{2,30}$	236907.656	206.9	15.50	†		
tEME-EE	$32_{1,31}$-$31_{2,30}$	236907.687	206.9	15.50	†		
tEME-EE’	$32_{1,31}$-$31_{2,30}$	236907.687	206.9	15.50	†		
tEME-EE’	$30_{1,30}$-$29_{0,29}$	237763.517	177.1	24.69	237763.2	1.76	
tEME-EE	$30_{1,30}$-$29_{0,29}$	237763.517	177.1	24.69	†		
tEME-AE	$30_{1,30}$-$29_{0,29}$	237763.527	177.1	24.69	†		
tEME-EA	$30_{1,30}$-$29_{0,29}$	237763.653	177.1	24.69	†		
tEME-AA	$30_{1,30}$-$29_{0,29}$	237763.664	177.1	24.69	†		
tEME-EE’	$15_{3,13}$-$14_{2,12}$	237865.715	56.7	4.79	237866.1	1.40	
tEME-EE	$15_{3,13}$-$14_{2,12}$	237865.778	56.7	4.80	†		
tEME-AE	$15_{3,13}$-$14_{2,12}$	237866.042	56.7	4.80	†		
tEME-EA	$15_{3,13}$-$14_{2,12}$	237868.339	56.7	4.80	...	...	U-line
tEME-AA	$15_{3,13}$-$14_{2,12}$	237868.635	56.7	4.80	...	...	"
tEME-EA	$9_{4,6}$-$8_{3,5}$	240195.817	35.8	1.64	240196.7	2.66	$^{13}CH_3OCOH$
tEME-EE	$9_{4,5}$-$8_{3,5}$	240196.101	35.8	3.88	†		
tEME-EE’	$9_{4,6}$-$8_{3,6}$	240196.396	35.8	3.88	†		
tEME-EE’	$9_{4,5}$-$8_{3,5}$	240196.642	35.8	3.88	†		
tEME-AE	$9_{4,5}$-$8_{3,5}$	240196.777	35.8	3.88	†		
tEME-EE	$9_{4,6}$-$8_{3,6}$	240196.937	35.8	3.88	†		
tEME-AE	$9_{4,6}$-$8_{3,6}$	240197.045	35.8	3.88	†		
tEME-AA	$9_{4,6}$-$8_{3,5}$	240197.196	35.8	3.88	†		
tEME-EA	$9_{4,5}$-$8_{3,5}$	240197.654	35.8	3.88	†		
tEME-EA	$9_{4,6}$-$8_{3,6}$	240201.478	35.8	2.63	...	...	CH_3OCOH v_t=1
tEME-AA	$9_{4,5}$-$8_{3,6}$	240202.719	35.8	4.28	...	...	"
tEME-EA	$9_{4,5}$-$8_{3,6}$	240203.315	35.8	1.64	...	...	"
tEME-EE	$15_{3,12}$-$14_{2,13}$	242035.318	56.8	4.68	...	...	CH_2DOH; CH_2DCN
tEME-EE’	$15_{3,12}$-$14_{2,13}$	242035.380	56.8	4.68	...	...	"
tEME-AE	$15_{3,12}$-$14_{2,13}$	242035.647	56.8	4.68	...	...	"
tEME-EA	$15_{3,12}$-$14_{2,13}$	242037.704	56.8	4.68	...	...	CH_2DOCOH
tEME-AA	$15_{3,12}$-$14_{2,13}$	242038.002	56.8	4.68	...	...	"
tEME-EE’	$26_{2,25}$-$25_{1,24}$	242161.785	139.8	10.89	242163.3	1.86	
tEME-EE	$26_{2,25}$-$25_{1,24}$	242161.785	139.8	10.89	†		
tEME-AE	$26_{2,25}$-$25_{1,24}$	242161.884	139.8	10.89	†		
tEME-EA	$26_{2,25}$-$25_{1,24}$	242163.015	139.8	10.89	†		
tEME-AA	$26_{2,25}$-$25_{1,24}$	242163.114	139.8	10.89	†		
tEME-EA	$31_{0,31}$-$30_{1,30}$	242163.369	188.7	25.69	†		
tEME-AA	$31_{0,31}$-$30_{1,30}$	242163.371	188.7	25.69	†		
tEME-EE	$31_{0,31}$-$30_{1,30}$	242163.434	188.7	25.69	†		

Table A.1. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed frequency (MHz)	T (K)	Blends
tEME-EE'	$31_{0,31}$-$30_{1,30}$	242163.434	188.7	25.69	†		
tEME-AE	$31_{0,31}$-$30_{1,30}$	242163.436	188.7	25.69	†		
tEME-EE'	$16_{3,14}$-$15_{2,13}$	245103.550	62.9	4.99	245103.4	0.92	
tEME-EE	$16_{3,14}$-$15_{2,13}$	245103.592	62.9	4.99	†		
tEME-AE	$16_{3,14}$-$15_{2,13}$	245103.864	62.9	4.99	†		
tEME-EA	$16_{3,14}$-$15_{2,13}$	245106.133	62.9	4.99	245106.4 †	1.13	CH_3OCOH v_t=2
tEME-EA	$16_{3,14}$-$15_{2,13}$	245106.426	62.9	5.00	†		
tEME-EE'	$31_{1,31}$-$30_{0,30}$	245274.088	188.8	25.71	245274.0	2.44	
tEME-EE	$31_{1,31}$-$30_{0,30}$	245274.088	188.8	25.71	†		
tEME-AE	$31_{1,31}$-$30_{0,30}$	245274.098	188.8	25.71	†		
tEME-EA	$31_{1,31}$-$30_{0,30}$	245274.211	188.8	25.71	†		
tEME-AA	$31_{1,31}$-$30_{0,30}$	245274.221	188.8	25.71	†		
tEME-AA	$33_{1,32}$-$32_{2,31}$	246605.346	219.6	16.51	246605.6	0.92	
tEME-EA	$33_{1,32}$-$32_{2,31}$	246605.372	219.6	16.51	†		
tEME-AE	$33_{1,32}$-$32_{2,31}$	246606.066	219.6	16.51	†		
tEME-EE	$33_{1,32}$-$32_{2,31}$	246606.092	219.6	16.51	†		
tEME-EE'	$33_{1,32}$-$32_{2,31}$	246606.092	219.6	16.51	†		

Note.- Lines of *trans*-$CH_3CH_2OCH_3$ (tEME) ground state present in the spectral scan of Orion KL from the ALMA interferometer. Column 1 indicates the species, Column 2 gives the transition, Column 3 the predicted frequency, Column 4 upper level energy, Column 5 the line strength, Column 6 observed frequency at the peak channel of the line (relative to a v_{LSR} of +7.5 km s^{-1}), Column 7 brightness temperature at the peak channel of the line, and Column 8 shows blends with other molecular species.
† Blended with previous line.

Table A.2. Lines of *trans*-$CH_3CH_2OCH_3$ in 30m data

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-AA	$13_{0,13}$-$12_{1,12}$	88665.592	35.0	7.66	88665.8	0.05	0.01	U-line
tEME-EA	$13_{0,13}$-$12_{1,12}$	88665.628	35.0	7.66	†			
tEME-AE	$13_{0,13}$-$12_{1,12}$	88666.042	35.0	7.66	†			
tEME-EE	$13_{0,13}$-$12_{1,12}$	88666.078	35.0	7.66	†			
tEME-EE’	$13_{0,13}$-$12_{1,12}$	88666.078	35.0	7.66	†			
tEME-EE’	$10_{1,10}$-$9_{0,9}$	97575.502	22.0	6.04	...	...	0.01	CH_3OH
tEME-EE	$10_{1,10}$-$9_{0,9}$	97575.502	22.0	6.04	†			
tEME-AE	$10_{1,10}$-$9_{0,9}$	97575.556	22.0	6.04	†			
tEME-EA	$10_{1,10}$-$9_{0,9}$	97576.027	22.0	6.04	†			
tEME-AA	$10_{1,10}$-$9_{0,9}$	97576.081	22.0	6.04	†			
tEME-AA	$14_{0,14}$-$13_{1,13}$	97678.316	40.4	8.52	...	...	0.01	CH_3OH, CH_3CH_2CN v_{13}/v_{21}
tEME-EA	$14_{0,14}$-$13_{1,13}$	97678.350	40.4	8.52	†			
tEME-AE	$14_{0,14}$-$13_{1,13}$	97678.746	40.4	8.52	†			
tEME-EE	$14_{0,14}$-$13_{1,13}$	97678.779	40.4	8.52	†			
tEME-EE’	$14_{0,14}$-$13_{1,13}$	97678.779	40.4	8.52	†			
tEME-EE	$26_{3,23}$-$26_{2,24}$	101017.882	146.4	17.08	...	...	0.01	U-line
tEME-EE’	$26_{3,23}$-$26_{2,24}$	101017.884	146.4	17.08	†			
tEME-AE	$26_{3,23}$-$26_{2,24}$	101018.111	146.4	17.08	†			
tEME-EE	$25_{3,22}$-$25_{2,23}$	102684.892	136.2	16.03	102684.6	0.07	0.01	^{18}OCS
tEME-EE’	$25_{3,22}$-$25_{2,23}$	102684.894	136.2	16.03	†			
tEME-AE	$25_{3,22}$-$25_{2,23}$	102685.127	136.2	16.03	†			
tEME-EE	$24_{3,21}$-$24_{2,22}$	104364.955	126.5	15.03	...	...	0.01	CH_3CH_2CN
tEME-EE’	$24_{3,21}$-$24_{2,22}$	104364.959	126.5	15.03	†			
tEME-AE	$24_{3,21}$-$24_{2,22}$	104365.198	126.5	15.03	†			
tEME-EE’	$11_{1,11}$-$10_{0,10}$	104401.631	26.2	6.73	...	...	0.02	CH_2CHCN
tEME-EE	$11_{1,11}$-$10_{0,10}$	104401.631	26.2	6.73	†			
tEME-AE	$11_{1,11}$-$10_{0,10}$	104401.683	26.2	6.73	†			
tEME-EA	$11_{1,11}$-$10_{0,10}$	104402.145	26.2	6.73	†			
tEME-AA	$11_{1,11}$-$10_{0,10}$	104402.196	26.2	6.73	†			
tEME-EE	$23_{3,20}$-$23_{2,21}$	106030.362	117.2	14.09	...	...	0.01	CH_3OCOH
tEME-EE’	$23_{3,20}$-$23_{2,21}$	106030.367	117.2	14.09	†			
tEME-AE	$23_{3,20}$-$23_{2,21}$	106030.611	117.2	14.09	†			
tEME-AA	$15_{0,15}$-$14_{1,14}$	106666.950	46.1	9.41	...	...	0.02	CH_3OCOH
tEME-EA	$15_{0,15}$-$14_{1,14}$	106666.980	46.1	9.41	†			
tEME-AE	$15_{0,15}$-$14_{1,14}$	106667.358	46.1	9.41	†			
tEME-EE	$15_{0,15}$-$14_{1,14}$	106667.388	46.1	9.41	†			
tEME-EE’	$15_{0,15}$-$14_{1,14}$	106667.388	46.1	9.41	†			
tEME-EE	$21_{3,18}$-$21_{2,19}$	109216.897	99.8	12.35	109215.1	0.02	0.01	U-line
tEME-EE’	$21_{3,18}$-$21_{2,19}$	109216.904	99.8	12.35	†			
tEME-AE	$21_{3,18}$-$21_{2,19}$	109217.159	99.8	12.35	†			
tEME-EA	$21_{3,18}$-$21_{2,19}$	109219.323	99.8	12.35	109219.6	0.01	0.01	
tEME-AA	$21_{3,18}$-$21_{2,19}$	109219.581	99.8	12.35	†			
tEME-EE	$20_{3,17}$-$20_{2,18}$	110694.695	91.6	11.56	...	...	0.02	CH_3CN v_8=1
tEME-EE’	$20_{3,17}$-$20_{2,18}$	110694.705	91.6	11.56	†			
tEME-AE	$20_{3,17}$-$20_{2,18}$	110694.963	91.6	11.56	†			
tEME-EA	$20_{3,17}$-$20_{2,18}$	110697.132	91.6	11.56	...	...	0.01	CH_3CN v_8=1
tEME-AA	$20_{3,17}$-$20_{2,18}$	110697.395	91.6	11.56	†			
tEME-EE’	$12_{1,12}$-$11_{0,11}$	111178.747	30.8	7.46	111178.7	0.03	0.02	
tEME-EE	$12_{1,12}$-$11_{0,11}$	111178.747	30.8	7.46	†			
tEME-AE	$12_{1,12}$-$11_{0,11}$	111178.796	30.8	7.46	†			
tEME-EA	$12_{1,12}$-$11_{0,11}$	111179.248	30.8	7.46	†			
tEME-AA	$12_{1,12}$-$11_{0,11}$	111179.297	30.8	7.46	†			
tEME-EE	$19_{3,16}$-$19_{2,17}$	112072.074	83.9	10.80	112072.3	0.03	0.02	
tEME-EE’	$19_{3,16}$-$19_{2,17}$	112072.088	83.9	10.80	†			
tEME-AE	$19_{3,16}$-$19_{2,17}$	112072.349	83.9	10.80	†			
tEME-EA	$19_{3,16}$-$19_{2,17}$	112074.518	83.9	10.80	112074.5	0.03	0.01	
tEME-AA	$19_{3,16}$-$19_{2,17}$	112074.786	83.9	10.80	†			
tEME-EE	$18_{3,15}$-$18_{2,16}$	113336.061	76.5	10.08	113336.2	0.02	0.02	
tEME-EE’	$18_{3,15}$-$18_{2,16}$	113336.081	76.5	10.08	†			
tEME-AE	$18_{3,15}$-$18_{2,16}$	113336.343	76.5	10.08	†			
tEME-EA	$18_{3,15}$-$18_{2,16}$	113338.507	76.5	10.08	113338.7	0.03	0.01	$CH_2{}^{13}CHCN$
tEME-AA	$18_{3,15}$-$18_{2,16}$	113338.779	76.5	10.08	†			
tEME-EE	$17_{3,14}$-$17_{2,15}$	114477.615	69.5	9.39	114477.9	0.05	0.02	U-line
tEME-EE’	$17_{3,14}$-$17_{2,15}$	114477.643	69.5	9.39	†			
tEME-AE	$17_{3,14}$-$17_{2,15}$	114477.905	69.5	9.39	†			
tEME-EA	$17_{3,14}$-$17_{2,15}$	114480.057	69.5	9.39	...	...	0.01	CH_3COOCH_3
tEME-AA	$17_{3,14}$-$17_{2,15}$	114480.333	69.5	9.39	†			
tEME-AE	$20_{1,19}$-$19_{2,18}$	114717.852	83.4	6.11	114718.0	0.06	0.01	CH_3CHO v_t=1
tEME-EE	$20_{1,19}$-$19_{2,18}$	114717.961	83.4	6.11	†			
tEME-EE’	$20_{1,19}$-$19_{2,18}$	114717.962	83.4	6.11	†			
tEME-EE	$16_{3,13}$-$16_{2,14}$	115491.673	62.9	8.73	...	...	0.02	CH_3CHO
tEME-EE’	$16_{3,13}$-$16_{2,14}$	115491.713	62.9	8.73	†			
tEME-AE	$16_{3,13}$-$16_{2,14}$	115491.972	62.9	8.73	†			
tEME-EA	$16_{3,13}$-$16_{2,14}$	115494.106	62.9	8.73	...	...	0.02	CH_3CHO
tEME-AA	$16_{3,13}$-$16_{2,14}$	115494.385	62.9	8.73	†			
tEME-AA	$16_{0,16}$-$15_{1,15}$	115618.006	52.2	10.34	115618.4	0.07	0.04	
tEME-EA	$16_{0,16}$-$15_{1,15}$	115618.033	52.2	10.34	†			
tEME-AE	$16_{0,16}$-$15_{1,15}$	115618.391	52.2	10.34	†			
tEME-EE	$16_{0,16}$-$15_{1,15}$	115618.417	52.2	10.34	†			
tEME-EE’	$16_{0,16}$-$15_{1,15}$	115618.417	52.2	10.34	†			
tEME-EE’	$19_{3,17}$-$19_{2,18}$	123318.746	83.8	10.04	123318.8	0.02	0.02	
tEME-EE	$19_{3,17}$-$19_{2,18}$	123318.760	83.8	10.04	†			
tEME-AE	$19_{3,17}$-$19_{2,18}$	123319.043	83.8	10.04	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[1] frequency (MHz)	Observed[1] T_{MB} (K)	Model[2] T_{MB} (K)	Blends
tEME-EA	$19_{3,17}$-$19_{2,18}$	123321.168	83.8	10.04	123321.3	0.04	0.01	$CH_3O^{13}COH$
tEME-AA	$19_{3,17}$-$19_{2,18}$	123321.458	83.8	10.04	†			
tEME-EE'	$20_{3,18}$-$20_{2,19}$	124043.337	91.6	10.58	124043.5	0.03	0.02	$CH_3COOH v_t$=1
tEME-EE	$20_{3,18}$-$20_{2,19}$	124043.347	91.6	10.58	†			
tEME-AE	$20_{3,18}$-$20_{2,19}$	124043.631	91.6	10.58	†			
tEME-EA	$20_{3,18}$-$20_{2,19}$	124045.738	91.6	10.58	124046.0	0.02	0.01	
tEME-AA	$20_{3,18}$-$20_{2,19}$	124046.027	91.6	10.58	†			
tEME-AA	$17_{0,17}$-$16_{1,16}$	124519.803	58.7	11.29	124519.5	0.19	0.05	U-line
tEME-EA	$17_{0,17}$-$16_{1,16}$	124519.826	58.7	11.29	†			
tEME-AE	$17_{0,17}$-$16_{1,16}$	124520.163	58.7	11.29	†			
tEME-EE	$17_{0,17}$-$16_{1,16}$	124520.186	58.7	11.29	†			
tEME-EE'	$17_{0,17}$-$16_{1,16}$	124520.186	58.7	11.29	†			
tEME-EE'	$14_{1,14}$-$13_{0,13}$	124648.594	41.0	9.02	124649.0	0.06	0.04	
tEME-EE	$14_{1,14}$-$13_{0,13}$	124648.594	41.0	9.02	†			
tEME-AE	$14_{1,14}$-$13_{0,13}$	124648.637	41.0	9.02	†			
tEME-EA	$14_{1,14}$-$13_{0,13}$	124649.062	41.0	9.02	†			
tEME-AA	$14_{1,14}$-$13_{0,13}$	124649.106	41.0	9.02	†			
tEME-EE'	$21_{3,19}$-$21_{2,20}$	124866.195	99.7	11.10	...	...	0.02	SO_2
tEME-EE	$21_{3,19}$-$21_{2,20}$	124866.202	99.7	11.10	†			
tEME-AE	$21_{3,19}$-$21_{2,20}$	124866.487	99.7	11.10	†			
tEME-EA	$21_{3,19}$-$21_{2,20}$	124868.576	99.7	11.10	...	...	0.01	SO_2
tEME-AA	$21_{3,19}$-$21_{2,20}$	124868.864	99.7	11.10	†			
tEME-AA	$21_{1,20}$-$20_{2,19}$	125001.226	91.6	6.68	...	...	0.01	CH_3OCOH
tEME-EA	$21_{1,20}$-$20_{2,19}$	125001.329	91.6	6.68	†			
tEME-AE	$21_{1,20}$-$20_{2,19}$	125002.535	91.6	6.68	...	...	0.02	CH_3OCOH
tEME-EE	$21_{1,20}$-$20_{2,19}$	125002.638	91.6	6.68	†			
tEME-EE'	$21_{1,20}$-$20_{2,19}$	125002.638	91.6	6.68	†			
tEME-EE'	$7_{2,6}$-$6_{1,5}$	125433.445	15.4	2.61	...	...	0.01	CH_3CH_2CN, SO_2
tEME-EE	$7_{2,6}$-$6_{1,5}$	125433.472	15.4	2.61	†			
tEME-AE	$7_{2,6}$-$6_{1,5}$	125433.646	15.4	2.61	†			
tEME-EE'	$22_{3,20}$-$22_{2,21}$	125793.386	108.2	11.61	...	...	0.02	CH_3CH_2CN v_{13}/v_{21}
tEME-EE	$22_{3,20}$-$22_{2,21}$	125793.392	108.2	11.61	†			
tEME-AE	$22_{3,20}$-$22_{2,21}$	125793.677	108.2	11.61	†			
tEME-EA	$22_{3,20}$-$22_{2,21}$	125795.748	108.2	11.61	...	...	0.01	CH_3CH_2CN v_{13}/v_{21}
tEME-AA	$22_{3,20}$-$22_{2,21}$	125796.036	108.2	11.61	†			
tEME-EE'	$23_{3,21}$-$23_{2,22}$	126830.671	117.1	12.11	...	...	0.02	$HC^{13}CCN$
tEME-EE	$23_{3,21}$-$23_{2,22}$	126830.675	117.1	12.11	†			
tEME-AE	$23_{3,21}$-$23_{2,22}$	126830.960	117.1	12.11	†			
tEME-EA	$23_{3,21}$-$23_{2,22}$	126833.013	117.1	12.11	...	...	0.01	$HC^{13}CCN$
tEME-AA	$23_{3,21}$-$23_{2,22}$	126833.301	117.1	12.11	†			
tEME-EE'	$24_{3,22}$-$24_{2,23}$	127983.452	126.4	12.59	127983.6	0.07	0.02	U-line
tEME-EE	$24_{3,22}$-$24_{2,23}$	127983.456	126.4	12.59	†			
tEME-AE	$24_{3,22}$-$24_{2,23}$	127983.741	126.4	12.59	†			
tEME-EA	$24_{3,22}$-$24_{2,23}$	127985.776	126.4	12.59	127986.1	0.06	0.01	NH_2CHO v_{12}=1
tEME-AA	$24_{3,22}$-$24_{2,23}$	127986.063	126.4	12.59	†			
tEME-EE'	$25_{3,23}$-$25_{2,24}$	129256.739	136.1	13.06	129256.8	0.04	0.02	
tEME-EE	$25_{3,23}$-$25_{2,24}$	129256.741	136.1	13.06	†			
tEME-AE	$25_{3,23}$-$25_{2,24}$	129257.027	136.1	13.06	†			
tEME-EA	$25_{3,23}$-$25_{2,24}$	129259.044	136.1	13.06	129259.3	0.04	0.01	
tEME-AA	$25_{3,23}$-$25_{2,24}$	129259.331	136.0	13.06	†			
tEME-EE'	$26_{3,24}$-$26_{2,25}$	130655.101	146.1	13.52	...	...	0.02	U-line
tEME-EE	$26_{3,24}$-$26_{2,25}$	130655.103	146.1	13.52	†			
tEME-AE	$26_{3,24}$-$26_{2,25}$	130655.389	146.1	13.52	†			
tEME-EA	$26_{3,24}$-$26_{2,25}$	130657.388	146.1	13.52	...	...	0.01	U-line
tEME-AA	$26_{3,24}$-$26_{2,25}$	130657.674	146.1	13.52	†			
tEME-EE'	$15_{1,15}$-$14_{0,14}$	131372.619	46.7	9.86	131372.7	0.05	0.05	
tEME-EE	$15_{1,15}$-$14_{0,14}$	131372.619	46.7	9.86	†			
tEME-AE	$15_{1,15}$-$14_{0,14}$	131372.660	46.7	9.86	†			
tEME-EA	$15_{1,15}$-$14_{0,14}$	131373.069	46.7	9.86	†			
tEME-AA	$15_{1,15}$-$14_{0,14}$	131373.110	46.7	9.86	†			
tEME-EE'	$27_{3,25}$-$27_{2,26}$	132182.639	156.6	13.95	132182.8	0.04	0.02	
tEME-EE	$27_{3,25}$-$27_{2,26}$	132182.640	156.6	13.95	†			
tEME-AE	$27_{3,25}$-$27_{2,26}$	132182.927	156.6	13.95	†			
tEME-EA	$27_{3,25}$-$27_{2,26}$	132184.906	156.6	13.95	132185.5	0.01	0.01	
tEME-AA	$27_{3,25}$-$27_{2,26}$	132185.194	156.6	13.95	†			
tEME-EE'	$8_{2,7}$-$7_{1,6}$	132547.336	18.5	2.87	132547.2	0.02	0.02	
tEME-EE	$8_{2,7}$-$7_{1,6}$	132547.352	18.5	2.87	†			
tEME-AE	$8_{2,7}$-$7_{1,6}$	132547.529	18.5	2.87	†			
tEME-EA	$8_{2,7}$-$7_{1,6}$	132548.982	18.5	2.87	132549.0	0.02	0.01	
tEME-AA	$8_{2,7}$-$7_{1,6}$	132549.167	18.5	2.87	†			
tEME-AA	$18_{0,18}$-$17_{1,17}$	133362.763	65.6	12.27	...	...	0.06	$O^{13}CS$, CH_2CHCN v_{11}=1
tEME-EA	$18_{0,18}$-$17_{1,17}$	133362.784	65.6	12.27	†			
tEME-AE	$18_{0,18}$-$17_{1,17}$	133363.098	65.6	12.27	†			
tEME-EE	$18_{0,18}$-$17_{1,17}$	133363.118	65.6	12.27	†			
tEME-EE'	$18_{0,18}$-$17_{1,17}$	133363.118	65.6	12.27	†			
tEME-EE'	$28_{3,26}$-$28_{2,27}$	133842.950	167.4	14.37	...	...	0.02	CH_2DOH
tEME-EE	$28_{3,26}$-$28_{2,27}$	133842.951	167.4	14.37	†			
tEME-AE	$28_{3,26}$-$28_{2,27}$	133843.238	167.4	14.37	†			
tEME-EA	$28_{3,26}$-$28_{2,27}$	133845.198	167.4	14.37	...	...	0.01	CH_2DOH
tEME-AA	$28_{3,26}$-$28_{2,27}$	133845.486	167.4	14.37	†			
tEME-AA	$22_{1,21}$-$21_{2,20}$	135315.986	100.2	7.28	135316.0	0.07	0.01	U-line
tEME-EA	$22_{1,21}$-$21_{2,20}$	135316.082	100.2	7.28	†			
tEME-AE	$22_{1,21}$-$21_{2,20}$	135317.259	100.2	7.28	135317.5	0.05	0.02	CH_3CHO v_t=1

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-EE	$22_{1,21}$-$21_{2,20}$	135317.355	100.2	7.28	†			
tEME-EE'	$22_{1,21}$-$21_{2,20}$	135317.355	100.2	7.28	†			
tEME-EE'	$29_{3,27}$-$29_{2,28}$	135639.103	178.6	14.77	...	...	0.02	CH_3OCOH v_t=1
tEME-EE	$29_{3,27}$-$29_{2,28}$	135639.104	178.6	14.77	†			
tEME-AE	$29_{3,27}$-$29_{2,28}$	135639.392	178.6	14.77	†			
tEME-EA	$29_{3,27}$-$29_{2,28}$	135641.333	178.6	14.77	...	...	0.01	CH_3OCOH v_t=1
tEME-AA	$29_{3,27}$-$29_{2,28}$	135641.621	178.6	14.77	†			
tEME-EE'	$30_{3,28}$-$30_{2,29}$	137573.618	190.2	15.14	137573.7	0.04	0.02	
tEME-EE	$30_{3,28}$-$30_{2,29}$	137573.618	190.2	15.14	†			
tEME-AE	$30_{3,28}$-$30_{2,29}$	137573.907	190.2	15.14	†			
tEME-EA	$30_{3,28}$-$30_{2,29}$	137575.829	190.2	15.14	137575.9	0.05	0.02	CH_3COOCH_3
tEME-AA	$30_{3,28}$-$30_{2,29}$	137576.118	190.2	15.14	†			
tEME-EE'	$16_{1,16}$-$15_{0,15}$	138109.231	52.7	10.73	138109.7	0.06	0.06	
tEME-EE	$16_{1,16}$-$15_{0,15}$	138109.231	52.7	10.73	†			
tEME-AE	$16_{1,16}$-$15_{0,15}$	138109.269	52.7	10.73	†			
tEME-EA	$16_{1,16}$-$15_{0,15}$	138109.661	52.7	10.73	†			
tEME-AA	$16_{1,16}$-$15_{0,15}$	138109.699	52.7	10.73	†			
tEME-EE'	$9_{2,8}$-$8_{1,7}$	139530.181	22.0	3.15	...	...	0.02	CH_2DCN
tEME-EE	$9_{2,8}$-$8_{1,7}$	139530.191	22.0	3.15	†			
tEME-AE	$9_{2,8}$-$8_{1,7}$	139530.369	22.0	3.15	†			
tEME-EA	$9_{2,8}$-$8_{1,7}$	139531.807	22.0	3.15	...	...	0.01	CH_2DCN
tEME-AA	$9_{2,8}$-$8_{1,7}$	139531.989	22.0	3.15	†			
tEME-EE'	$31_{3,29}$-$31_{2,30}$	139648.445	202.2	15.50	...	...	0.02	CH_3COCH_3
tEME-EE	$31_{3,29}$-$31_{2,30}$	139648.445	202.2	15.50	†			
tEME-AE	$31_{3,29}$-$31_{2,30}$	139648.735	202.2	15.50	†			
tEME-EA	$31_{3,29}$-$31_{2,30}$	139650.637	202.2	15.50	...	...	0.01	CH_3COCH_3
tEME-AA	$31_{3,29}$-$31_{2,30}$	139650.927	202.2	15.50	†			
tEME-EE	$8_{2,6}$-$7_{1,7}$	140527.950	18.5	2.43	140528.1	0.02	0.02	
tEME-EE'	$8_{2,6}$-$7_{1,7}$	140527.966	18.5	2.43	†			
tEME-AE	$8_{2,6}$-$7_{1,7}$	140528.160	18.5	2.43	†			
tEME-EA	$8_{2,6}$-$7_{1,7}$	140529.589	18.5	2.43	140529.6	0.03	0.01	U-line
tEME-AA	$8_{2,6}$-$7_{1,7}$	140529.791	18.5	2.43	†			
tEME-EE'	$32_{3,30}$-$32_{2,31}$	141864.954	214.6	15.83	...	...	0.02	CH_3COOH v_t=1
tEME-EE	$32_{3,30}$-$32_{2,31}$	141864.954	214.6	15.83	†			
tEME-AE	$32_{3,30}$-$32_{2,31}$	141865.246	214.6	15.83	†			
tEME-EA	$32_{3,30}$-$32_{2,31}$	141867.127	214.6	15.83	...	...	0.01	CH_3COOH v_t=1
tEME-AA	$32_{3,30}$-$32_{2,31}$	141867.419	214.6	15.83	†			
tEME-AA	$19_{0,19}$-$18_{1,18}$	142139.587	72.8	13.27	142139.7	0.08	0.06	
tEME-EA	$19_{0,19}$-$18_{1,18}$	142139.605	72.8	13.27	†			
tEME-AE	$19_{0,19}$-$18_{1,18}$	142139.896	72.8	13.27	†			
tEME-EE	$19_{0,19}$-$18_{1,18}$	142139.914	72.8	13.27	†			
tEME-EE'	$19_{0,19}$-$18_{1,18}$	142139.914	72.8	13.27	†			
tEME-EE'	$3_{3,1}$-$2_{2,1}$	143977.261	12.7	2.45	143977.8	0.06	0.02	U-line
tEME-EE	$3_{3,1}$-$2_{2,1}$	143977.759	12.7	2.41	†			
tEME-AE	$3_{3,1}$-$2_{2,1}$	143977.810	12.7	2.44	†			
tEME-EA	$3_{3,1}$-$2_{2,0}$	143979.010	12.7	.72	143980.0	0.05	0.02	CH_3COCH_3
tEME-EE	$3_{3,0}$-$2_{2,0}$	143979.276	12.7	2.41	†			
tEME-EE'	$3_{3,0}$-$2_{2,0}$	143979.774	12.7	2.45	†			
tEME-AE	$3_{3,0}$-$2_{2,0}$	143979.832	12.7	2.44	†			
tEME-AA	$3_{3,1}$-$2_{2,0}$	143980.192	12.7	2.50	†			
tEME-EA	$3_{3,0}$-$2_{2,0}$	143980.533	12.7	1.78	†			
tEME-EE'	$33_{3,31}$-$33_{2,32}$	144223.924	227.3	16.14	144224.0	0.02	0.01	
tEME-EE	$33_{3,31}$-$33_{2,32}$	144223.925	227.3	16.14	†			
tEME-AE	$33_{3,31}$-$33_{2,32}$	144224.218	227.3	16.14	†			
tEME-EE'	$17_{1,17}$-$16_{0,16}$	144871.829	59.2	11.63	144872.1	0.06	0.06	
tEME-EE	$17_{1,17}$-$16_{0,16}$	144871.829	59.2	11.63	†			
tEME-AE	$17_{1,17}$-$16_{0,16}$	144871.864	59.2	11.63	†			
tEME-EA	$17_{1,17}$-$16_{0,16}$	144872.238	59.2	11.63	†			
tEME-AA	$17_{1,17}$-$16_{0,16}$	144872.273	59.2	11.63	†			
tEME-AA	$23_{1,22}$-$22_{2,21}$	145647.137	109.2	7.92	145647.4	0.03	0.01	
tEME-EA	$23_{1,22}$-$22_{2,21}$	145647.226	109.2	7.92	†			
tEME-AE	$23_{1,22}$-$22_{2,21}$	145648.372	109.2	7.92	145648.6	0.03	0.02	
tEME-EE	$23_{1,22}$-$22_{2,21}$	145648.461	109.2	7.92	†			
tEME-EE'	$23_{1,22}$-$22_{2,21}$	145648.462	109.2	7.92	†			
tEME-EE'	$10_{2,9}$- $9_{1,8}$	146383.619	25.8	3.44	146384.0	0.03	0.02	
tEME-EE	$10_{2,9}$- $9_{1,8}$	146383.626	25.8	3.44	†			
tEME-AE	$10_{2,9}$- $9_{1,8}$	146383.802	25.8	3.44	†			
tEME-EA	$10_{2,9}$- $9_{1,8}$	146385.228	25.8	3.44	146385.5	0.03	0.02	
tEME-AA	$10_{2,9}$- $9_{1,8}$	146385.408	25.8	3.44	†			
tEME-EE	$36_{4,32}$-$36_{3,33}$	146397.039	276.3	21.88	...	...	0.01	SO_2, CH_3OCH_3
tEME-EE'	$36_{4,32}$-$36_{3,33}$	146397.042	276.3	21.88	†			
tEME-AE	$36_{4,32}$-$36_{3,33}$	146397.310	276.3	21.88	†			
tEME-EE'	$34_{3,32}$-$34_{2,33}$	146725.545	240.5	16.44	146725.6	0.03	0.01	$SO^{18}O$
tEME-EE	$34_{3,32}$-$34_{2,33}$	146725.545	240.5	16.44	†			
tEME-AE	$34_{3,32}$-$34_{2,33}$	146725.840	240.5	16.44	†			
tEME-AE	$29_{2,27}$-$28_{3,26}$	146736.865	174.4	6.43	...	...	0.01	U-line
tEME-EE	$29_{2,27}$-$28_{3,26}$	146737.046	174.4	6.43	†			
tEME-EE'	$29_{2,27}$-$28_{3,26}$	146737.048	174.4	6.43	†			
tEME-EE	$35_{4,31}$-$35_{3,32}$	148578.427	262.3	20.95	...	...	0.01	CH_3OCOH v_t=1
tEME-EE'	$35_{4,31}$-$35_{3,32}$	148578.431	262.3	20.95	†			
tEME-AE	$35_{4,31}$-$35_{3,32}$	148578.707	262.3	20.95	†			
tEME-EE'	$35_{3,33}$-$35_{2,34}$	149369.412	254.0	16.71	...	...	0.01	CH_3OCOH v_t=1
tEME-EE	$35_{3,33}$-$35_{2,34}$	149369.412	254.0	16.71	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-AE	$35_{3,33}$-$35_{2,34}$	149369.709	254.0	16.71	†			
tEME-EE	$9_{2,7}$-$8_{1,8}$	149921.139	22.0	2.54	...	...	0.02	CH_3OCOH
tEME-EE’	$9_{2,7}$-$8_{1,8}$	149921.149	22.0	2.54	†			
tEME-AE	$9_{2,7}$-$8_{1,8}$	149921.348	22.0	2.54	†			
tEME-EA	$9_{2,7}$-$8_{1,8}$	149922.787	22.0	2.54	...	...	0.01	CH_3OCOH
tEME-AA	$9_{2,7}$-$8_{1,8}$	149922.992	22.0	2.54	†			
tEME-EE	$34_{4,30}$-$34_{3,31}$	150661.347	248.7	20.06	150661.4	0.04	0.02	U-line
tEME-EE’	$34_{4,30}$-$34_{3,31}$	150661.353	248.7	20.06	†			
tEME-AE	$34_{4,30}$-$34_{3,31}$	150661.636	248.7	20.06	†			
tEME-EA	$34_{4,30}$-$34_{3,31}$	150664.261	248.7	20.06	150664.4	0.03	0.02	U-line
tEME-AA	$34_{4,30}$-$34_{3,31}$	150664.547	248.7	20.06	†			
tEME-AA	$20_{0,20}$-$19_{1,19}$	150845.281	80.4	14.28	150845.4	0.08	0.09	
tEME-EA	$20_{0,20}$-$19_{1,19}$	150845.296	80.4	14.28	†			
tEME-AE	$20_{0,20}$-$19_{1,19}$	150845.565	80.4	14.28	†			
tEME-EE	$20_{0,20}$-$19_{1,19}$	150845.580	80.4	14.28	†			
tEME-EE’	$20_{0,20}$-$19_{1,19}$	150845.580	80.4	14.28	†			
tEME-EE’	$18_{1,18}$-$17_{0,17}$	151672.109	66.0	12.56	151672.4	0.06	0.09	
tEME-EE	$18_{1,18}$-$17_{0,17}$	151672.109	66.0	12.56	†			
tEME-AE	$18_{1,18}$-$17_{0,17}$	151672.141	66.0	12.56	†			
tEME-EA	$18_{1,18}$-$17_{0,17}$	151672.495	66.0	12.56	†			
tEME-AA	$18_{1,18}$-$17_{0,17}$	151672.527	66.0	12.56	†			
tEME-EE’	$11_{2,10}$-$10_{1,9}$	153109.700	30.1	3.73	153109.7	0.05	0.03	
tEME-EE	$11_{2,10}$-$10_{1,9}$	153109.705	30.1	3.73	†			
tEME-AE	$11_{2,10}$-$10_{1,9}$	153109.879	30.1	3.73	†			
tEME-EA	$11_{2,10}$-$10_{1,9}$	153111.294	30.1	3.73	153111.4	0.05	0.02	U-line
tEME-AA	$11_{2,10}$-$10_{1,9}$	153111.471	30.1	3.73	†			
tEME-EE	$32_{4,28}$-$32_{3,29}$	154467.850	222.8	18.42	154468.1	0.02	0.02	
tEME-EE’	$32_{4,28}$-$32_{3,29}$	154467.860	222.8	18.42	†			
tEME-AE	$32_{4,28}$-$32_{3,29}$	154468.157	222.8	18.42	†			
tEME-AA	$24_{1,23}$-$23_{2,22}$	155980.202	118.5	8.61	...	...	0.03	CH_3CH_2CN v_{12}=1
tEME-EA	$24_{1,23}$-$23_{2,22}$	155980.284	118.5	8.61	†			
tEME-AE	$24_{1,23}$-$23_{2,22}$	155981.396	118.5	8.61	...	...	0.03	CH_3CH_2CN v_{12}=1
tEME-EE	$24_{1,23}$-$23_{2,22}$	155981.478	118.5	8.61	†			
tEME-EE’	$24_{1,23}$-$23_{2,22}$	155981.479	118.5	8.61	†			
tEME-EE	$31_{4,27}$-$31_{3,28}$	156169.103	210.3	17.65	...	...	0.02	CH_3CH_2CN
tEME-EE’	$31_{4,27}$-$31_{3,28}$	156169.114	210.3	17.65	†			
tEME-AE	$31_{4,27}$-$31_{3,28}$	156169.418	210.3	17.65	†			
tEME-EE	$30_{4,26}$-$31_{3,27}$	157727.158	198.3	16.91	157727.3	0.03	0.02	
tEME-EE’	$30_{4,26}$-$31_{3,27}$	157727.174	198.3	16.91	†			
tEME-AE	$30_{4,26}$-$31_{3,27}$	157727.482	198.3	16.91	†			
tEME-EE’	$19_{1,19}$-$18_{0,18}$	158519.756	73.2	13.52	...	...	0.10	CH_3OCOH v_t=1, CH_3COCH_3
tEME-EE	$19_{1,19}$-$18_{0,18}$	158519.756	73.2	13.52	†			
tEME-AE	$19_{1,19}$-$18_{0,18}$	158519.786	73.2	13.52	†			
tEME-EA	$19_{1,19}$-$18_{0,18}$	158520.119	73.2	13.52	†			
tEME-AA	$19_{1,19}$-$18_{0,18}$	158520.149	73.2	13.52	†			
tEME-EE	$29_{4,25}$-$29_{3,26}$	159140.100	186.7	16.20	...	...	0.03	U-line
tEME-EE’	$29_{4,25}$-$29_{3,26}$	159140.121	186.7	16.19	†			
tEME-AE	$29_{4,25}$-$29_{3,26}$	159140.432	186.7	16.20	†			
tEME-EA	$29_{4,25}$-$29_{3,26}$	159143.035	186.7	16.20	...	...	0.02	U-line
tEME-AA	$29_{4,25}$-$29_{3,26}$	159143.357	186.7	16.20	†			
tEME-AA	$21_{0,21}$-$20_{1,20}$	159477.061	88.4	15.31	159477.1	0.15	0.10	CH_2CN
tEME-EA	$21_{0,21}$-$20_{1,20}$	159477.074	88.4	15.31	†			
tEME-AE	$21_{0,21}$-$20_{1,20}$	159477.319	88.4	15.31	†			
tEME-EE	$21_{0,21}$-$20_{1,20}$	159477.332	88.4	15.31	†			
tEME-EE’	$21_{0,21}$-$20_{1,20}$	159477.332	88.4	15.31	†			
tEME-EE	$10_{2,8}$-$9_{1,9}$	159548.654	25.9	2.61	159548.8	0.09	0.02	CH_3COOH v_t=2
tEME-EE’	$10_{2,8}$-$9_{1,9}$	159548.661	25.9	2.61	†	"	"	
tEME-AE	$10_{2,8}$-$9_{1,9}$	159548.866	25.9	2.61	†	"	"	
tEME-EE’	$12_{2,11}$-$11_{1,10}$	159710.946	34.7	4.05	...	...	0.03	CH_3CH_2CN v_{12}/v_{21}
tEME-EE	$12_{2,11}$-$11_{1,10}$	159710.950	34.7	4.05	†			
tEME-AE	$12_{2,11}$-$11_{1,10}$	159711.121	34.7	4.05	†			
tEME-EA	$12_{2,11}$-$11_{1,10}$	159712.526	34.7	4.05	...	...	0.02	CH_3CH_2CN v_{12}/v_{21}
tEME-AA	$12_{2,11}$-$11_{1,10}$	159712.699	34.7	4.05	†			
tEME-EE	$28_{4,24}$-$28_{3,25}$	160409.193	175.5	15.50	...	...	0.03	CH_3COCH_3
tEME-EE’	$28_{4,24}$-$28_{3,25}$	160409.221	175.5	15.50	†			
tEME-AE	$28_{4,24}$-$28_{3,25}$	160409.535	175.5	15.50	†			
tEME-EA	$28_{4,24}$-$28_{3,25}$	160412.123	175.5	15.50	...	...	0.02	CH_3OCOH v_t=1
tEME-AA	$28_{4,24}$-$28_{3,25}$	160412.450	175.5	15.50	†			
tEME-EE’	$10_{3,8}$-$9_{2,7}$	199842.884	31.6	3.55	199843.5	...	0.05	CH_3OCOH v_t=2
tEME-EE	$10_{3,8}$-$9_{2,7}$	199843.513	31.6	3.65	†			
tEME-AE	$10_{3,8}$-$9_{2,7}$	199843.521	31.6	3.61	†			
tEME-EA	$10_{3,8}$-$9_{2,7}$	199846.703	31.6	3.78	...	...	0.04	CH_3OCOH v_t=1
tEME-AA	$10_{3,8}$-$9_{2,7}$	199847.033	31.6	3.78	†			
tEME-EE’	$4_{4,1}$-$3_{3,1}$	199953.072	22.3	3.50	199953.5	0.18	0.06	CH_3CH_2OH
tEME-EE	$4_{4,1}$-$3_{3,1}$	199953.406	22.3	3.50	†			
tEME-AE	$4_{4,1}$-$3_{3,1}$	199953.633	22.3	3.50	†			
tEME-EE	$4_{4,0}$-$3_{3,0}$	199954.307	22.3	3.50	199954.7	0.12	0.06	CH_3CH_2OH
tEME-EE’	$4_{4,0}$-$3_{3,0}$	199954.642	22.3	3.50	†			
tEME-AE	$4_{4,0}$-$3_{3,0}$	199954.869	22.3	3.50	†			
tEME-EA	$4_{4,1}$-$3_{3,1}$	199956.750	22.3	3.50	199957.2	0.19	0.08	CH_2CHCN v_{15}=1
tEME-EA	$4_{4,0}$-$3_{3,0}$	199957.085	22.3	3.50	†			
tEME-AA	$4_{4,1}$-$3_{3,0}$	199957.305	22.3	3.50	†			
tEME-AA	$4_{4,0}$-$3_{3,1}$	199957.317	22.3	3.50	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-EE	$10_{3,7}$-$9_{2,8}$	200603.336	31.6	3.64	...	...	0.05	U-line
tEME-AE	$10_{3,7}$-$9_{2,8}$	200603.932	31.6	3.59	†			
tEME-EE'	$10_{3,7}$-$9_{2,8}$	200603.965	31.6	3.54	†			
tEME-EA	$10_{3,7}$-$9_{2,8}$	200605.130	31.6	3.76	...	...	0.04	CH_3OCOH
tEME-AA	$10_{3,7}$-$9_{2,8}$	200605.404	31.6	3.77	†			
tEME-EE	$14_{2,12}$-$13_{1,13}$	200820.096	45.3	2.62	...	...	0.04	CH_3OH
tEME-EE'	$14_{2,12}$-$13_{1,13}$	200820.098	45.3	2.62	†			
tEME-AE	$14_{2,12}$-$13_{1,13}$	200820.324	45.3	2.62	†			
tEME-EA	$14_{2,12}$-$13_{1,13}$	200821.765	45.3	2.62	...	...	0.03	CH_3OH
tEME-AA	$14_{2,12}$-$13_{1,13}$	200821.991	45.3	2.62	†			
tEME-EE'	$25_{1,25}$-$24_{0,24}$	200871.974	124.2	19.55	200872.2	0.59	0.20	CH_2CHCN v_{11}=2
tEME-EE	$25_{1,25}$-$24_{0,24}$	200871.975	124.2	19.55	†			
tEME-AE	$25_{1,25}$-$24_{0,24}$	200871.991	124.2	19.55	†			
tEME-EA	$25_{1,25}$-$24_{0,24}$	200872.199	124.2	19.55	†			
tEME-AA	$25_{1,25}$-$24_{0,24}$	200872.216	124.2	19.55	†			
tEME-AA	$26_{0,26}$-$25_{1,25}$	201553.272	133.9	20.51	201553.4	0.32	0.21	
tEME-EA	$26_{0,26}$-$25_{1,25}$	201553.275	133.9	20.51	†			
tEME-AE	$26_{0,26}$-$25_{1,25}$	201553.416	133.9	20.51	†			
tEME-EE	$26_{0,26}$-$25_{1,25}$	201553.419	133.9	20.51	†			
tEME-EE'	$26_{0,26}$-$25_{1,25}$	201553.419	133.9	20.51	†			
tEME-EE'	$19_{2,18}$-$18_{1,17}$	202767.815	77.9	6.76	...	...	0.08	$H^{13}CCCN$, CH_3CN v_8=1
tEME-EE	$19_{2,18}$-$18_{1,17}$	202767.815	77.9	6.76	†			
tEME-AE	$19_{2,18}$-$18_{1,17}$	202767.956	77.9	6.76	†			
tEME-EA	$19_{2,18}$-$18_{1,17}$	202769.267	77.9	6.76	...	...	0.05	$H^{13}CCCN$, CH_3CN v_8=1
tEME-AA	$19_{2,18}$-$18_{1,17}$	202769.407	77.9	6.76	†			
tEME-AA	$29_{1,28}$-$28_{2,27}$	207138.789	170.9	12.63	207139.6	0.07	0.07	
tEME-EA	$29_{1,28}$-$28_{2,27}$	207138.838	170.9	12.63	†			
tEME-AE	$29_{1,28}$-$28_{2,27}$	207139.740	170.9	12.63	†			
tEME-EE	$29_{1,28}$-$28_{2,27}$	207139.789	170.9	12.63	†			
tEME-EE'	$29_{1,28}$-$28_{2,27}$	207139.789	170.9	12.63	†			
tEME-EE'	$11_{3,9}$-$10_{2,8}$	207643.771	35.9	3.90	...	...	0.07	CH_3CH_2CN
tEME-EE	$11_{3,9}$-$10_{2,8}$	207644.152	35.9	3.94	†			
tEME-AE	$11_{3,9}$-$10_{2,8}$	207644.276	35.9	3.92	†			
tEME-EA	$11_{3,9}$-$10_{2,8}$	207647.053	35.9	3.99	207647.4	0.20	0.05	CH_3CH_2CN
tEME-AA	$11_{3,9}$-$10_{2,8}$	207647.369	35.9	3.99	†			
tEME-EE'	$5_{4,2}$-$4_{3,2}$	208004.136	24.2	3.60	...	...	0.07	CH_3CH_2CN, CH_3CH_2OH
tEME-EE	$5_{4,2}$-$4_{3,2}$	208004.469	24.2	3.60	†			
tEME-AE	$5_{4,2}$-$4_{3,2}$	208004.696	24.2	3.60	†			
tEME-EE	$5_{4,1}$-$4_{3,1}$	208005.368	24.2	3.60	†			
tEME-EE'	$5_{4,1}$-$4_{3,1}$	208005.702	24.2	3.60	†			
tEME-AE	$5_{4,1}$-$4_{3,1}$	208005.929	24.2	3.60	†			
tEME-EA	$5_{4,2}$-$4_{3,2}$	208007.812	24.2	3.60	...	...	0.09	CH_3CH_2CN, CH_3CH_2OH
tEME-EA	$5_{4,1}$-$4_{3,1}$	208008.143	24.2	3.60	†			
tEME-AA	$5_{4,2}$-$4_{3,1}$	208008.330	24.2	3.60	†			
tEME-AA	$5_{4,1}$-$4_{3,2}$	208008.413	24.2	3.60	†			
tEME-EE'	$26_{1,26}$-$25_{0,25}$	208147.627	134.1	20.57	208147.7	0.58	0.22	CH_2CHCN v_{11}=1
tEME-EE	$26_{1,26}$-$25_{0,25}$	208147.627	134.1	20.57	†			
tEME-AE	$26_{1,26}$-$25_{0,25}$	208147.642	134.1	20.57	†			
tEME-EA	$26_{1,26}$-$25_{0,25}$	208147.831	134.1	20.57	†			
tEME-AA	$26_{1,26}$-$25_{0,25}$	208147.846	134.1	20.57	†			
tEME-EE'	$20_{2,19}$-$19_{1,18}$	208541.474	85.6	7.24	208541.5	0.19	0.08	
tEME-EE	$20_{2,19}$-$19_{1,18}$	208541.474	85.6	7.24	†			
tEME-AE	$20_{2,19}$-$19_{1,18}$	208541.609	85.6	7.24	†			
tEME-EA	$20_{2,19}$-$19_{1,18}$	208542.901	85.6	7.24	208543.0	0.16	0.05	
tEME-AA	$20_{2,19}$-$19_{1,18}$	208543.036	85.6	7.24	†			
tEME-EE	$11_{3,8}$-$10_{2,9}$	208783.787	35.9	3.92	...	...	0.07	CH_3OCOH
tEME-EE'	$11_{3,8}$-$10_{2,9}$	208784.168	35.9	3.88	†			
tEME-AE	$11_{3,8}$-$10_{2,9}$	208784.265	35.9	3.90	†			
tEME-EA	$11_{3,8}$-$10_{2,9}$	208785.864	35.9	3.96	...	...	0.05	CH_3OCOH
tEME-AA	$11_{3,8}$-$10_{2,9}$	208786.150	35.9	3.96	†			
tEME-AA	$27_{0,27}$-$26_{1,26}$	209774.111	144.1	21.55	209774.0	0.35	0.22	CH_2CHCN v_{15}=1
tEME-EA	$27_{0,27}$-$26_{1,26}$	209774.113	144.1	21.55	†			
tEME-AE	$27_{0,27}$-$26_{1,26}$	209774.236	144.1	21.55	†			
tEME-EE	$27_{0,27}$-$26_{1,26}$	209774.238	144.1	21.55	†			
tEME-EE'	$27_{0,27}$-$26_{1,26}$	209774.238	144.1	21.55	†			
tEME-EE	$15_{2,13}$-$14_{1,14}$	211933.388	51.2	2.56	...	...	0.04	CH_3OCOH
tEME-EE'	$15_{2,13}$-$14_{1,14}$	211933.389	51.2	2.56	†			
tEME-AE	$15_{2,13}$-$14_{1,14}$	211933.621	51.2	2.56	†			
tEME-EA	$15_{2,13}$-$14_{1,14}$	211935.057	51.2	2.56	...	...	0.03	CH_3OCOH
tEME-AA	$15_{2,13}$-$14_{1,14}$	211935.290	51.2	2.56	†			
tEME-EE	$32_{5,27}$-$32_{4,28}$	212287.353	232.9	17.12	...	...	0.04	CH_3COCH_3
tEME-EE'	$32_{5,27}$-$32_{4,28}$	212287.576	232.9	17.07	†			
tEME-AE	$32_{5,27}$-$32_{4,28}$	212287.827	232.9	17.10	†			
tEME-EA	$32_{5,27}$-$32_{4,28}$	212290.165	232.9	17.17	...	...	0.03	CH_3COCH_3
tEME-AA	$32_{5,27}$-$32_{4,28}$	212290.528	232.9	17.17	†			
tEME-EE	$31_{5,26}$-$31_{4,27}$	212762.787	220.6	16.46	...	...	0.03	CH_3OCH_3
tEME-EE'	$31_{5,26}$-$31_{4,27}$	212763.095	220.6	16.37	†			
tEME-AE	$31_{5,26}$-$31_{4,27}$	212763.306	220.6	16.42	†			
tEME-EA	$31_{5,26}$-$31_{4,27}$	212765.533	220.6	16.55	212766.9	0.14	0.03	CH_3OCH_3
tEME-AA	$31_{5,26}$-$31_{4,27}$	212765.897	220.6	16.55	†			
tEME-EE	$30_{5,25}$-$30_{4,26}$	213178.397	208.6	15.77	...	...	0.04	U-line
tEME-EE'	$30_{5,25}$-$30_{4,26}$	213178.825	208.6	15.61	†			
tEME-AE	$30_{5,25}$-$30_{4,26}$	213178.976	208.6	15.70	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[1] frequency (MHz)	Observed[1] T_{MB} (K)	Model[2] T_{MB} (K)	Blends
tEME-EA	$30_{5,25}$-$30_{4,26}$	213181.046	208.6	15.93	213181.4	0.21	0.03	CH_2OHCHO
tEME-AA	$30_{5,25}$-$30_{4,26}$	213181.410	208.6	15.94	†			
tEME-EE'	$33_{5,29}$-$33_{4,30}$	213495.962	245.7	17.69	213495.8	0.09	0.04	U-line
tEME-EE	$33_{5,29}$-$33_{4,30}$	213496.124	245.7	17.72	†			
tEME-AE	$33_{5,29}$-$33_{4,30}$	213496.418	245.7	17.71	†			
tEME-EA	$33_{5,29}$-$33_{4,30}$	213499.211	245.7	17.75	213499.3	0.10	0.03	U-line
tEME-AA	$33_{5,29}$-$33_{4,30}$	213499.587	245.7	17.75	†			
tEME-EE	$29_{5,24}$-$29_{4,25}$	213540.983	196.9	15.03	213541.4	0.16	0.05	CH_2CHCN v_{11}=2
tEME-EE'	$29_{5,24}$-$29_{4,25}$	213541.573	196.9	14.74	†			
tEME-AE	$29_{5,24}$-$29_{4,25}$	213541.643	196.9	14.89	†			
tEME-EA	$29_{5,24}$-$29_{4,25}$	213543.491	196.9	15.32	...	...	0.04	CH_2CHCN v_{11}=2
tEME-AA	$29_{5,24}$-$29_{4,25}$	213543.850	196.9	15.33	†			
tEME-EE'	$32_{5,28}$-$32_{4,29}$	213676.308	232.9	17.03	213676.5	0.20	0.04	CH_3CH_2OH
tEME-EE	$32_{5,28}$-$32_{4,29}$	213676.530	232.9	17.09	†			
tEME-AE	$32_{5,28}$-$32_{4,29}$	213676.802	232.9	17.06	†			
tEME-EA	$32_{5,28}$-$32_{4,29}$	213679.692	232.9	17.13	213680.0	0.14	0.03	CH_3COOCH_3
tEME-AA	$32_{5,28}$-$32_{4,29}$	213680.076	232.9	17.14	†			
tEME-EE'	$31_{5,27}$-$31_{4,28}$	213854.674	220.5	16.34	...	...	0.05	CH_3CH_2OH
tEME-EE	$31_{5,27}$-$31_{4,28}$	213854.982	220.5	16.44	†			
tEME-AE	$31_{5,27}$-$31_{4,28}$	213855.220	220.5	16.39	†			
tEME-EE	$28_{5,23}$-$28_{4,24}$	213856.708	185.7	14.18	...	...	0.05	CH_3CH_2OH
tEME-AE	$28_{5,23}$-$28_{4,24}$	213857.473	185.7	13.94	†			
tEME-EE'	$28_{5,23}$-$28_{4,24}$	213857.509	185.7	13.70	†			
tEME-EA	$31_{5,27}$-$31_{4,28}$	213858.239	220.5	16.52	...	...	0.05	CH_3CH_2OH
tEME-AA	$31_{5,27}$-$31_{4,28}$	213858.632	220.5	16.53	†			
tEME-EA	$28_{5,23}$-$28_{4,24}$	213859.015	185.7	14.70	†			
tEME-AA	$28_{5,23}$-$28_{4,24}$	213859.367	185.7	14.73	†			
tEME-EE'	$30_{5,26}$-$30_{4,27}$	214028.729	208.6	15.59	...	...	0.05	CH_3COCH_3
tEME-EE	$30_{5,26}$-$30_{4,27}$	214029.157	208.6	15.76	†			
tEME-AE	$30_{5,26}$-$30_{4,27}$	214029.345	208.6	15.68	†			
tEME-EA	$30_{5,26}$-$30_{4,27}$	214032.539	208.6	15.91	...	...	0.04	
tEME-AA	$30_{5,26}$-$30_{4,27}$	214032.943	208.6	15.92	†			
tEME-EE	$27_{5,22}$-$27_{4,23}$	214131.118	174.9	13.15	...	...	0.04	$CH_3CH_2{}^{13}CN$, CH_3COOH v_t=1
tEME-AE	$27_{5,22}$-$27_{4,23}$	214132.010	174.9	12.80	†			
tEME-EE'	$27_{5,22}$-$27_{4,23}$	214132.166	174.9	12.45	†			
tEME-EA	$27_{5,22}$-$27_{4,23}$	214133.150	174.9	14.07	...	...	0.04	$CH_3CH_2{}^{13}CN$, CH_3COOH v_t=1
tEME-AA	$27_{5,22}$-$27_{4,23}$	214133.486	174.9	14.14	†			
tEME-EE'	$29_{5,25}$-$29_{4,25}$	214196.531	196.9	14.72	...	...	0.05	$CH_3{}^{13}CH_2CN$, $CH_3O^{13}COH$ v_t=1
tEME-EE	$29_{5,25}$-$29_{4,25}$	214197.122	196.9	15.02	†			
tEME-AE	$29_{5,25}$-$29_{4,25}$	214197.239	196.9	14.88	†			
tEME-EA	$29_{5,25}$-$29_{4,25}$	214200.673	196.9	15.30	...	...	0.04	$CH_3{}^{13}CH_2CN$, $CH_3O^{13}COH$ v_t=1
tEME-AA	$29_{5,25}$-$29_{4,25}$	214201.091	196.9	15.32	†			
tEME-EE'	$21_{2,20}$-$20_{1,19}$	214246.202	93.7	7.76	214246.2	0.15	0.09	$^{13}CH_3CN$
tEME-EE	$21_{2,20}$-$20_{1,19}$	214246.202	93.7	7.76	†			
tEME-AE	$21_{2,20}$-$20_{1,19}$	214246.332	93.7	7.76	†			
tEME-EA	$21_{2,20}$-$20_{1,19}$	214247.602	93.7	7.76	214247.7	0.11	0.06	$^{13}CH_3CN$
tEME-AA	$21_{2,20}$-$20_{1,19}$	214247.732	93.7	7.76	†			
tEME-EE'	$26_{5,22}$-$26_{4,22}$	214355.828	164.4	2.47	...	...	0.05	SO, $^{13}CH_3CN$
tEME-EE'	$28_{5,24}$-$28_{4,25}$	214356.510	185.7	13.69	†			
tEME-AE	$26_{5,22}$-$26_{4,22}$	214356.963	164.4	2.08	†			
tEME-EE	$26_{5,22}$-$26_{4,22}$	214357.232	164.4	1.63	†			
tEME-EE	$28_{5,24}$-$28_{4,25}$	214357.312	185.7	14.17	†			
tEME-AE	$28_{5,24}$-$28_{4,25}$	214357.333	185.7	13.93	†			
tEME-EA	$28_{5,24}$-$28_{4,25}$	214361.091	185.7	14.69	...	...	0.04	SO, $^{13}CH_3CN$
tEME-AA	$28_{5,24}$-$28_{4,25}$	214361.527	185.7	14.72	†			
tEME-EE	$26_{5,21}$-$26_{4,22}$	214369.161	164.4	11.92	...	...	0.07	SO, $^{13}CH_3CN$
tEME-AE	$26_{5,21}$-$26_{4,22}$	214370.185	164.4	11.47	†			
tEME-EE'	$26_{5,21}$-$26_{4,22}$	214370.456	164.4	11.08	†			
tEME-EA	$26_{5,21}$-$26_{4,22}$	214370.843	164.4	13.42	†			
tEME-AA	$26_{5,21}$-$26_{4,22}$	214371.154	164.4	13.55	†			
tEME-EE'	$27_{5,23}$-$27_{4,24}$	214507.462	174.9	12.45	...	...	0.04	CH_3CH_2CN
tEME-AE	$27_{5,23}$-$27_{4,24}$	214508.414	174.9	12.79	†			
tEME-EE	$27_{5,23}$-$27_{4,24}$	214508.510	174.9	13.15	†			
tEME-EA	$27_{5,23}$-$27_{4,24}$	214512.591	174.9	14.07	...	...	0.04	CH_3CH_2CN
tEME-AA	$27_{5,23}$-$27_{4,24}$	214513.051	174.9	14.13	†			
tEME-EE	$25_{5,20}$-$25_{4,21}$	214575.213	154.4	10.55	...	...	0.09	$^{13}C^{17}O$
tEME-AE	$25_{5,20}$-$25_{4,21}$	214576.349	154.4	10.10	†			
tEME-EA	$25_{5,20}$-$25_{4,21}$	214576.498	154.4	12.69	†			
tEME-EE'	$25_{5,20}$-$25_{4,21}$	214576.706	154.4	9.74	†			
tEME-AA	$25_{5,20}$-$25_{4,21}$	214576.769	154.4	12.96	†			
tEME-EE'	$26_{5,22}$-$26_{4,23}$	214648.535	164.4	11.08	...	...	0.04	CH_3OCOH
tEME-AE	$26_{5,22}$-$26_{4,23}$	214649.611	164.4	11.47	†			
tEME-EE	$26_{5,22}$-$26_{4,23}$	214649.829	164.4	11.92	†			
tEME-EA	$26_{5,22}$-$26_{4,23}$	214654.288	164.5	13.41	...	...	0.04	CH_3OCOH
tEME-AA	$26_{5,22}$-$26_{4,23}$	214654.781	164.5	13.54	†			
tEME-EE	$24_{5,19}$-$24_{4,20}$	214753.118	144.7	9.23	214754.3	0.20	0.09	
tEME-EA	$24_{5,19}$-$24_{4,20}$	214754.023	144.7	11.84	†			
tEME-AA	$24_{5,19}$-$24_{4,20}$	214754.233	144.7	12.38	†			
tEME-AE	$24_{5,19}$-$24_{4,20}$	214754.329	144.7	8.86	†			
tEME-EE'	$24_{5,19}$-$24_{4,20}$	214754.733	144.7	8.60	†			
tEME-EE'	$25_{5,21}$-$25_{4,22}$	214779.208	154.4	9.74	...	...	0.04	CH_3OCOH
tEME-AE	$25_{5,21}$-$25_{4,22}$	214780.378	154.4	10.10	†			
tEME-EE	$25_{5,21}$-$25_{4,22}$	214780.701	154.4	10.55	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-EA	$25_{5,21}$-$25_{4,22}$	214785.581	154.4	12.69	...	...	0.04	CH_3OCOH
tEME-AA	$25_{5,21}$-$25_{4,22}$	214786.123	154.4	12.96	†			
tEME-EE’	$24_{5,20}$-$24_{4,21}$	214899.228	144.7	8.61	...	...	0.04	CH_3OCOH v_t=1
tEME-AE	$24_{5,20}$-$24_{4,21}$	214900.454	144.7	8.87	†			
tEME-EE	$24_{5,20}$-$24_{4,21}$	214900.844	144.7	9.23	†			
tEME-EA	$24_{5,20}$-$24_{4,21}$	214906.128	144.7	11.83	...	...	0.11	CH_3CH_2CN
tEME-EE	$23_{5,18}$-$23_{4,19}$	214906.260	135.4	8.13	†			
tEME-AA	$24_{5,20}$-$24_{4,21}$	214906.739	144.7	12.38	†			
tEME-EA	$23_{5,18}$-$23_{4,19}$	214906.872	135.4	10.76	†			
tEME-AA	$23_{5,18}$-$23_{4,19}$	214906.992	135.4	11.80	†			
tEME-AE	$23_{5,18}$-$23_{4,19}$	214907.507	135.4	7.91	†			
tEME-EE’	$23_{5,18}$-$23_{4,19}$	214907.924	135.4	7.77	†			
tEME-EE	$24_{5,19}$-$24_{4,21}$	214909.858	144.7	3.15	†			
tEME-EA	$24_{5,19}$-$24_{4,21}$	214910.548	144.7	0.55	†			
tEME-AE	$24_{5,19}$-$24_{4,21}$	214911.166	144.7	3.51	†			
tEME-EE’	$24_{5,19}$-$24_{4,21}$	214911.685	144.7	3.77	†			
tEME-EE’	$23_{5,19}$-$23_{4,20}$	215008.545	135.4	7.77	...	...	0.02	CH_3CH_2CN v_{13}/v_{21}
tEME-AE	$23_{5,19}$-$23_{4,20}$	215009.791	135.4	7.91	...	...	0.04	CH_3CH_2CN v_{13}/v_{21}
tEME-EE	$23_{5,19}$-$23_{4,20}$	215010.209	135.4	8.13	†			
tEME-EA	$23_{5,19}$-$23_{4,20}$	215015.810	135.4	10.75	215016.7	0.05	0.04	
tEME-AA	$23_{5,19}$-$23_{4,20}$	215016.519	135.4	11.80	†			
tEME-EA	$22_{5,18}$-$22_{4,18}$	215035.544	126.6	1.78	...	...	0.07	CH_3CH_2CN
tEME-EE	$22_{5,17}$-$22_{4,18}$	215037.639	126.6	7.33	†			
tEME-EA	$22_{5,17}$-$22_{4,18}$	215038.085	126.6	9.45	†			
tEME-AA	$22_{5,17}$-$22_{4,18}$	215038.089	126.6	11.23	†			
tEME-AE	$22_{5,17}$-$22_{4,18}$	215038.890	126.6	7.24	†			
tEME-EE’	$22_{5,17}$-$22_{4,18}$	215039.292	126.6	7.21	†			
tEME-AA	$35_{2,33}$-$34_{3,32}$	215107.148	250.8	9.27	...	...	0.03	CH_3CH_2CN
tEME-EA	$35_{2,33}$-$34_{3,32}$	215107.270	250.8	9.27	†			
tEME-EE’	$22_{5,18}$-$22_{4,19}$	215107.270	126.6	7.21	†			
tEME-AE	$22_{5,18}$-$22_{4,19}$	215108.508	126.6	7.24	†			
tEME-EE	$22_{5,18}$-$22_{4,19}$	215108.923	126.6	7.33	...	...	0.05	CH_3CH_2CN
tEME-AE	$35_{2,33}$-$34_{3,32}$	215109.184	250.8	9.27	†			
tEME-EE	$35_{2,33}$-$34_{3,32}$	215109.306	250.8	9.27	†			
tEME-EE’	$35_{2,33}$-$34_{3,32}$	215109.306	250.8	9.27	†			
tEME-EA	$22_{5,18}$-$22_{4,19}$	215114.713	126.6	9.45	...	...	0.04	CH_3CH_2CN
tEME-AA	$22_{5,18}$-$22_{4,19}$	215115.545	126.6	11.23	†			
tEME-EE	$22_{5,17}$-$22_{4,19}$	215117.232	126.6	3.90	†			
tEME-EA	$22_{5,17}$-$22_{4,19}$	215117.254	126.6	1.78	†			
tEME-AE	$22_{5,17}$-$22_{4,19}$	215118.679	126.6	3.99	†			
tEME-EE’	$22_{5,17}$-$22_{4,19}$	215119.312	126.6	4.02	†			
tEME-EA	$21_{5,17}$-$21_{4,17}$	215148.139	118.0	2.58	215150.3	0.25	0.07	CH_3COCH_3
tEME-EE	$21_{5,16}$-$21_{4,17}$	215149.914	118.0	6.81	†			
tEME-AA	$21_{5,16}$-$21_{4,17}$	215150.202	118.0	10.66	†			
tEME-EA	$21_{5,16}$-$21_{4,17}$	215150.327	118.0	8.07	†			
tEME-AE	$21_{5,16}$-$21_{4,17}$	215151.142	118.0	6.84	†			
tEME-EE’	$21_{5,16}$-$21_{4,17}$	215151.503	118.0	6.91	†			
tEME-EE’	$21_{5,17}$-$21_{4,18}$	215195.665	118.0	6.91	...	...	0.04	SO
tEME-AE	$21_{5,17}$-$21_{4,18}$	215196.869	118.0	6.84	†			
tEME-EE	$21_{5,17}$-$21_{4,18}$	215197.254	118.0	6.81	†			
tEME-EA	$21_{5,17}$-$21_{4,18}$	215203.100	118.0	8.07	...	...	0.04	SO
tEME-AA	$21_{5,17}$-$21_{4,18}$	215204.068	118.0	10.66	†			
tEME-EA	$21_{5,16}$-$21_{4,18}$	215205.287	118.0	2.58	†			
tEME-EE	$21_{5,16}$-$21_{4,18}$	215205.486	118.0	3.85	†			
tEME-EA	$20_{5,16}$-$20_{4,16}$	215243.901	109.9	3.19	...	...	0.07	SO
tEME-EE	$20_{5,15}$-$20_{4,16}$	215245.438	109.9	6.54	†			
tEME-AA	$20_{5,15}$-$20_{4,16}$	215245.691	109.9	10.09	†			
tEME-EA	$20_{5,15}$-$20_{4,16}$	215245.934	109.9	6.89	†			
tEME-AE	$20_{5,15}$-$20_{4,16}$	215246.615	109.9	6.68	†			
tEME-EE’	$20_{5,15}$-$20_{4,16}$	215246.907	109.9	6.83	†			
tEME-EE’	$20_{5,16}$-$20_{4,17}$	215274.126	109.9	6.83	...	...	0.04	CH_3CH_2CN v_{20}=1
tEME-AE	$20_{5,16}$-$20_{4,17}$	215275.268	109.9	6.68	†			
tEME-EE	$20_{5,16}$-$20_{4,17}$	215275.595	109.9	6.54	†			
tEME-EA	$20_{5,16}$-$20_{4,17}$	215281.378	109.9	6.89	...	...	0.04	CH_3CH_2CN v_{13}/v_{21}
tEME-AA	$20_{5,16}$-$20_{4,17}$	215282.470	109.9	10.09	†			
tEME-EA	$20_{5,15}$-$20_{4,17}$	215283.411	109.9	3.19	†			
tEME-EE	$20_{5,15}$-$20_{4,17}$	215283.810	109.9	3.55	†			
tEME-EA	$19_{5,15}$-$19_{4,15}$	215324.992	102.2	3.49	215326.9	0.20	0.08	CH_3OCOH
tEME-EE	$19_{5,14}$-$19_{4,15}$	215326.280	102.2	6.50	†			
tEME-AA	$19_{5,14}$-$19_{4,15}$	215326.637	102.2	9.52	†			
tEME-EA	$19_{5,14}$-$19_{4,15}$	215326.971	102.2	6.03	†			
tEME-AE	$19_{5,14}$-$19_{4,15}$	215327.373	102.2	6.72	†			
tEME-EE’	$19_{5,14}$-$19_{4,15}$	215327.561	102.2	6.95	†			
tEME-EE’	$19_{5,15}$-$19_{4,16}$	215343.169	102.2	6.95	215344.3	0.20	0.05	CH_3OCOH v_t=1
tEME-AE	$19_{5,15}$-$19_{4,16}$	215344.214	102.2	6.72	†			
tEME-EE	$19_{5,15}$-$19_{4,16}$	215344.450	102.2	6.50	†			
tEME-EA	$19_{5,15}$-$19_{4,16}$	215350.059	102.2	6.03	...	...	0.05	CH_3CH_2CN
tEME-AA	$19_{5,15}$-$19_{4,16}$	215351.248	102.2	9.52	†			
tEME-EE’	$12_{3,10}$-$11_{2,9}$	215361.252	40.5	4.16	...	...	0.07	CH_3CH_2CN v_{13}/v_{21}
tEME-EE	$12_{3,10}$-$11_{2,9}$	215361.484	40.5	4.18	†			
tEME-AE	$12_{3,10}$-$11_{2,9}$	215361.676	40.5	4.17	†			
tEME-EA	$12_{3,10}$-$11_{2,9}$	215364.224	40.5	4.19	...	...	0.05	CH_3CH_2CN v_{13}/v_{21}
tEME-AA	$12_{3,10}$-$11_{2,9}$	215364.533	40.5	4.20	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-EE	$18_{5,13}$-$18_{4,14}$	215394.256	94.8	6.65	...	...	0.11	CH_3CH_2CN
tEME-AA	$18_{5,13}$-$18_{4,14}$	215394.875	94.8	8.95	†			
tEME-AE	$18_{5,13}$-$18_{4,14}$	215395.227	94.8	6.94	†			
tEME-EA	$18_{5,13}$-$18_{4,14}$	215395.264	94.8	5.47	†			
tEME-EE'	$18_{5,13}$-$18_{4,14}$	215395.280	94.8	7.19	†			
tEME-EE'	$18_{5,14}$-$18_{4,15}$	215403.394	94.8	7.19	...	...	0.06	CH_3CH_2CN
tEME-AE	$18_{5,14}$-$18_{4,15}$	215404.308	94.8	6.94	†			
tEME-EE	$18_{5,14}$-$18_{4,15}$	215404.417	94.8	6.65	†			
tEME-EA	$18_{5,14}$-$18_{4,15}$	215409.728	94.8	5.47	...	...	0.09	CH_3CH_2CN v=0; v_{13}/v_{21}
tEME-AA	$18_{5,14}$-$18_{4,15}$	215410.979	94.8	8.95	†			
tEME-EA	$17_{5,13}$-$17_{4,13}$	215450.467	87.9	3.22	215451.8	0.47	0.11	CH_3CH_2CN v_{20}=1, NH_2CHO v_{12}=1
tEME-EE	$17_{5,13}$-$17_{4,13}$	215450.974	87.9	6.90	†			
tEME-EE'	$17_{5,13}$-$17_{4,13}$	215451.703	87.9	7.39	†			
tEME-AE	$17_{5,13}$-$17_{4,13}$	215451.799	87.9	7.18	†			
tEME-AA	$17_{5,13}$-$17_{4,13}$	215452.025	87.9	8.39	†			
tEME-EA	$17_{5,13}$-$17_{4,13}$	215452.436	87.9	5.17	†			
tEME-EE'	$17_{5,13}$-$17_{4,13}$	215455.422	87.9	7.39	...	...	0.07	CH_3CH_2CN v_{13}/v_{21}, CH_3CH_2OH
tEME-EE	$17_{5,13}$-$17_{4,13}$	215456.151	87.9	6.90	†			
tEME-AE	$17_{5,13}$-$17_{4,13}$	215456.193	87.9	7.18	†			
tEME-EA	$17_{5,13}$-$17_{4,14}$	215461.025	87.9	5.17	...	...	0.04	CH_3CH_2CN v_{13}/v_{21}, CH_3CH_2OH
tEME-AA	$17_{5,13}$-$17_{4,14}$	215462.304	87.9	8.39	†			
tEME-EA	$17_{5,12}$-$17_{4,14}$	215462.994	87.9	3.22	†			
tEME-EE'	$27_{1,27}$-$26_{0,26}$	215478.840	144.2	21.60	...	...	0.24	CH_3CH_2CN v_{13}/v_{21}
tEME-EE	$27_{1,27}$-$26_{0,26}$	215478.840	144.2	21.60	†			
tEME-AE	$27_{1,27}$-$26_{0,26}$	215478.854	144.2	21.60	†			
tEME-EA	$27_{1,27}$-$26_{0,26}$	215479.025	144.2	21.60	†			
tEME-AA	$27_{1,27}$-$26_{0,26}$	215479.039	144.2	21.60	†			
tEME-EE	$16_{5,11}$-$16_{4,12}$	215497.897	81.3	7.05	...	...	0.09	CH_3OCH_3, CH_3CH_2CN v_{13}/v_{21}
tEME-EA	$16_{5,12}$-$16_{4,12}$	215497.943	81.3	2.74	†			
tEME-EE'	$16_{5,11}$-$16_{4,12}$	215498.372	81.3	7.37	†			
tEME-AE	$16_{5,11}$-$16_{4,12}$	215498.590	81.3	7.24	†			
tEME-AA	$16_{5,11}$-$16_{4,12}$	215499.524	81.3	7.82	...	...	0.11	CH_3OCH_3, CH_3CH_2CN v_{13}/v_{21}
tEME-EE'	$16_{5,12}$-$16_{4,13}$	215499.830	81.3	7.37	†			
tEME-EA	$16_{5,11}$-$16_{4,12}$	215499.921	81.3	5.08	†			
tEME-EE	$16_{5,12}$-$16_{4,13}$	215500.305	81.3	7.05	†			
tEME-AE	$16_{5,12}$-$16_{4,13}$	215500.485	81.3	7.24	†			
tEME-EA	$16_{5,11}$-$16_{4,12}$	215504.636	81.3	5.08	...	...	0.05	CH_3OCH_3, CH_3CH_2CN v_{13}/v_{21}, $^{33}SH_2$
tEME-AA	$16_{5,12}$-$16_{4,13}$	215505.905	81.3	7.82	†			
tEME-EA	$16_{5,12}$-$16_{4,13}$	215506.613	81.3	2.74	†			
tEME-EE	$15_{5,10}$-$15_{4,11}$	215536.404	75.1	6.94	215536.9	0.25	0.15	CH_3OCOH v_t=1
tEME-EE'	$15_{5,10}$-$15_{4,11}$	215536.720	75.1	7.08	†			
tEME-EA	$15_{5,11}$-$15_{4,11}$	215537.002	75.1	2.05	†			
tEME-AE	$15_{5,10}$-$15_{4,11}$	215537.010	75.1	7.03	†			
tEME-EE'	$15_{5,11}$-$15_{4,12}$	215537.169	75.1	7.08	†			
tEME-EE	$15_{5,11}$-$15_{4,12}$	215537.485	75.1	6.94	†			
tEME-AE	$15_{5,11}$-$15_{4,12}$	215537.757	75.1	7.03	†			
tEME-AA	$15_{5,10}$-$15_{4,11}$	215538.650	75.1	7.25	...	...	0.04	CH_3OCOH v_t=1, CH_3CH_2CN v_{13}/v_{21}
tEME-EA	$15_{5,10}$-$15_{4,11}$	215538.990	75.1	5.21	†			
tEME-AA	$15_{5,10}$-$15_{4,11}$	215538.650	75.1	7.25	†			
tEME-EA	$15_{5,10}$-$15_{4,11}$	215538.990	75.1	5.21	†			
tEME-EA	$15_{5,11}$-$15_{4,12}$	215541.270	75.1	5.21	†			
tEME-AA	$15_{5,11}$-$15_{4,12}$	215542.488	75.1	7.25	†			
tEME-EE	$14_{5,9}$-$14_{4,10}$	215567.750	69.3	6.58	...	...	0.17	CH_3CH_2CN v_{20}=1
tEME-EE'	$14_{5,9}$-$14_{4,10}$	215567.993	69.3	6.63	†			
tEME-EE'	$14_{5,10}$-$14_{4,11}$	215568.043	69.3	6.63	†			
tEME-EE	$14_{5,10}$-$14_{4,11}$	215568.286	69.3	6.58	†			
tEME-AE	$14_{5,9}$-$14_{4,10}$	215568.316	69.3	6.61	†			
tEME-AE	$14_{5,10}$-$14_{4,11}$	215568.602	69.3	6.61	†			
tEME-EA	$14_{5,10}$-$14_{4,10}$	215568.774	69.3	1.23	†			
tEME-AA	$14_{5,9}$-$14_{4,10}$	215570.539	69.3	6.68	...	...	0.06	CH_3CH_2CN v_{13}/v_{21}
tEME-EA	$14_{5,9}$-$14_{4,10}$	215570.772	69.3	5.45	†			
tEME-EA	$14_{5,10}$-$14_{4,11}$	215571.650	69.3	5.45	†			
tEME-AA	$14_{5,10}$-$14_{4,11}$	215572.766	69.3	6.68	...	...	0.04	CH_3CH_2CN v_{13}/v_{21}
tEME-EA	$14_{5,9}$-$14_{4,11}$	215573.648	69.3	1.23	†			
tEME-EE	$13_{5,8}$-$13_{4,9}$	215593.014	63.9	6.08	...	...	0.17	CH_3CH_2CN v_{20}=1, SiO v=1
tEME-EE'	$13_{5,9}$-$13_{4,10}$	215593.138	63.9	6.09	†			
tEME-EE'	$13_{5,8}$-$13_{4,9}$	215593.228	63.9	6.09	†			
tEME-EE	$13_{5,9}$-$13_{4,10}$	215593.353	63.9	6.08	†			
tEME-AE	$13_{5,8}$-$13_{4,9}$	215593.566	63.9	6.09	†			
tEME-AE	$13_{5,9}$-$13_{4,10}$	215593.687	63.9	6.09	†			
tEME-AA	$13_{5,8}$-$13_{4,9}$	215596.207	63.9	6.11	...	...	0.09	$CH_3CH_2{}^{13}CN$, SiO v=1
tEME-EA	$13_{5,8}$-$13_{4,9}$	215596.289	63.9	5.58	†			
tEME-EA	$13_{5,9}$-$13_{4,10}$	215596.478	63.9	5.58	†			
tEME-EE	$12_{5,7}$-$12_{4,8}$	215613.102	58.9	5.52	...	...	0.18	CH_3CH_2OH, CH_3OCOH v_t=1, CH_3CH_2CN
tEME-EE'	$12_{5,8}$-$12_{4,9}$	215613.172	58.9	5.53	†			
tEME-EE'	$12_{5,7}$-$12_{4,8}$	215613.308	58.9	5.53	†			
tEME-EE	$12_{5,8}$-$12_{4,9}$	215613.378	58.9	5.52	†			
tEME-AE	$12_{5,7}$-$12_{4,8}$	215613.651	58.9	5.52	†			
tEME-AE	$12_{5,8}$-$12_{4,9}$	215613.720	58.9	5.52	†			
tEME-EA	$12_{5,8}$-$12_{4,9}$	215616.405	58.9	5.37	...	...	0.10	CH_3CH_2CN
tEME-EA	$12_{5,7}$-$12_{4,8}$	215616.490	58.9	5.37	†			
tEME-AA	$12_{5,7}$-$12_{4,8}$	215616.564	58.9	5.53	†			
tEME-AA	$12_{5,8}$-$12_{4,9}$	215617.221	58.9	5.53	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed(1) frequency (MHz)	Observed(1) T_{MB} (K)	Model(2) T_{MB} (K)	Blends
tEME-EE	$11_{5,6}$-$11_{4,7}$	215628.800	54.3	4.94	...	...	0.16	CH_3CH_2CN
tEME-EE'	$11_{5,7}$-$11_{4,8}$	215628.855	54.3	4.94	†			
tEME-EE'	$11_{5,6}$-$11_{4,7}$	215629.003	54.3	4.94	†			
tEME-EE	$11_{5,7}$-$11_{4,8}$	215629.058	54.3	4.94	†			
tEME-AE	$11_{5,6}$-$11_{4,7}$	215629.349	54.3	4.94	†			
tEME-AE	$11_{5,7}$-$11_{4,8}$	215629.404	54.3	4.94	...	...	0.10	CH_3CH_2CN
tEME-EA	$11_{5,7}$-$11_{4,8}$	215632.056	54.3	4.91	†			
tEME-EA	$11_{5,6}$-$11_{4,7}$	215632.229	54.3	4.91	†			
tEME-AA	$11_{5,6}$-$11_{4,7}$	215632.425	54.3	4.94	†			
tEME-AA	$11_{5,7}$-$11_{4,8}$	215632.754	54.3	4.94	†			
tEME-EE	$10_{5,5}$-$10_{4,6}$	215640.803	50.0	4.35	215641.1	0.18	0.13	CH_3COOH
tEME-EE'	$10_{5,6}$-$10_{4,7}$	215640.854	50.0	4.35	†			
tEME-EE'	$10_{5,5}$-$10_{4,6}$	215641.007	50.0	4.35	†			
tEME-EE	$10_{5,6}$-$10_{4,7}$	215641.058	50.0	4.35	†			
tEME-AE	$10_{5,5}$-$10_{4,6}$	215641.354	50.0	4.35	†			
tEME-AE	$10_{5,6}$-$10_{4,7}$	215641.405	50.0	4.35	†			
tEME-EA	$10_{5,6}$-$10_{4,7}$	215644.051	50.0	4.34	215644.4	0.21	0.10	CH_3COOH
tEME-EA	$10_{5,5}$-$10_{4,6}$	215644.248	50.0	4.34	†			
tEME-AA	$10_{5,5}$-$10_{4,6}$	215644.522	50.0	4.35	†			
tEME-AA	$10_{5,6}$-$10_{4,7}$	215644.676	50.0	4.35	†			
tEME-EE	$9_{5,4}$-$9_{4,5}$	215649.740	46.1	3.73	215650.1	0.42	0.12	CH_3CH_2CN v_{20}=1
tEME-EE'	$9_{5,5}$-$9_{4,6}$	215649.791	46.1	3.73	†			
tEME-EE'	$9_{5,4}$-$9_{4,5}$	215649.944	46.1	3.73	†			
tEME-EE	$9_{5,5}$-$9_{4,6}$	215649.995	46.1	3.73	†			
tEME-AE	$9_{5,4}$-$9_{4,5}$	215650.292	46.1	3.73	†			
tEME-AE	$9_{5,5}$-$9_{4,6}$	215650.343	46.1	3.73	†			
tEME-EA	$9_{5,5}$-$9_{4,6}$	215652.990	46.1	3.73	215653.4	0.42	0.08	CH_3CH_2CN v_{20}=1
tEME-EA	$9_{5,4}$-$9_{4,5}$	215653.193	46.1	3.73	†			
tEME-AA	$9_{5,4}$-$9_{4,5}$	215653.509	46.1	3.73	†			
tEME-AA	$9_{5,5}$-$9_{4,6}$	215653.575	46.1	3.73	†			
tEME-EE	$8_{5,3}$-$8_{4,4}$	215656.176	42.7	3.10	215656.4	0.43	0.11	CH_3CH_2CN v_{20}=1
tEME-EE'	$8_{5,4}$-$8_{4,5}$	215656.227	42.7	3.10	†			
tEME-EE'	$8_{5,3}$-$8_{4,4}$	215656.380	42.7	3.10	†			
tEME-EE	$8_{5,4}$-$8_{4,5}$	215656.432	42.7	3.10	†			
tEME-AE	$8_{5,3}$-$8_{4,4}$	215656.730	42.7	3.10	†			
tEME-AE	$8_{5,4}$-$8_{4,5}$	215656.781	42.7	3.10	†			
tEME-EA	$8_{5,4}$-$8_{4,5}$	215659.431	42.7	3.10	215659.8	0.36	0.09	CH_3CH_2CN v_{20}=1
tEME-EA	$8_{5,3}$-$8_{4,4}$	215659.635	42.7	3.10	†			
tEME-AA	$8_{5,3}$-$8_{4,4}$	215659.972	42.7	3.10	†			
tEME-AA	$8_{5,4}$-$8_{4,5}$	215659.998	42.7	3.10	†			
tEME-EE	$7_{5,2}$-$7_{4,3}$	215660.620	39.6	2.43	215660.8	0.34	0.11	CH_3CH_2CN v_{20}=1
tEME-EE'	$7_{5,3}$-$7_{4,4}$	215660.672	39.6	2.43	†			
tEME-EE'	$7_{5,2}$-$7_{4,3}$	215660.825	39.6	2.43	†			
tEME-EE	$7_{5,3}$-$7_{4,4}$	215660.877	39.6	2.43	†			
tEME-AE	$7_{5,2}$-$7_{4,3}$	215661.175	39.6	2.43	†			
tEME-AE	$7_{5,3}$-$7_{4,4}$	215661.227	39.6	2.43	†			
tEME-EE	$6_{5,1}$-$6_{4,2}$	215663.523	36.9	1.72	215663.9	0.30	0.11	CH_3CH_2CN v_{20}=1
tEME-EE'	$6_{5,2}$-$6_{4,3}$	215663.575	36.9	1.72	†			
tEME-EE'	$6_{5,1}$-$6_{4,2}$	215663.728	36.9	1.72	†			
tEME-EE	$6_{5,2}$-$6_{4,3}$	215663.780	36.9	1.72	†			
tEME-EA	$7_{5,3}$-$7_{4,4}$	215663.879	39.6	2.43	†			
tEME-AE	$6_{5,1}$-$6_{4,2}$	215664.080	36.9	1.72	†			
tEME-EA	$7_{5,2}$-$7_{4,3}$	215664.084	39.6	2.43	†			
tEME-AE	$6_{5,2}$-$6_{4,3}$	215664.131	36.9	1.72	†			
tEME-AA	$7_{5,2}$-$7_{4,3}$	215664.430	39.6	2.43	†			
tEME-AA	$7_{5,3}$-$7_{4,4}$	215664.439	39.6	2.43	†			
tEME-EE	$5_{5,0}$-$5_{4,1}$	215665.279	34.6	0.92	†			
tEME-EE'	$5_{5,1}$-$5_{4,2}$	215665.331	34.6	0.92	†			
tEME-EE'	$5_{5,0}$-$5_{4,1}$	215665.485	34.6	0.92	†			
tEME-EE	$5_{5,1}$-$5_{4,2}$	215665.537	34.6	0.92	†			
tEME-AE	$5_{5,0}$-$5_{4,1}$	215665.837	34.6	0.92	†			
tEME-AE	$5_{5,1}$-$5_{4,2}$	215665.889	34.6	0.92	†			
tEME-EA	$6_{5,2}$-$6_{4,2}$	215666.786	36.9	1.72	...	...	0.05	CH_3CH_2CN v=0, v_{20}=1
tEME-EA	$6_{5,1}$-$6_{4,2}$	215666.991	36.9	1.72	†			
tEME-EA	$5_{5,1}$-$5_{4,2}$	215668.545	34.6	0.92	†			
tEME-EA	$5_{5,0}$-$5_{4,1}$	215668.751	34.6	0.92	†			
tEME-AA	$5_{5,0}$-$5_{4,1}$	215669.103	34.6	0.92	†			
tEME-AA	$5_{5,1}$-$5_{4,2}$	215669.103	34.6	0.92	†			
tEME-EE'	$6_{4,3}$-$5_{3,3}$	216054.535	26.5	3.73	216054.9	0.30	0.08	CH_3CH_2CN v_{13}/v_{21}
tEME-EE	$6_{4,3}$-$5_{3,3}$	216054.868	26.5	3.73	†			
tEME-AE	$6_{4,3}$-$5_{3,3}$	216055.095	26.5	3.73	†			
tEME-EE	$6_{4,2}$-$5_{3,2}$	216055.759	26.5	3.73	†			
tEME-EE'	$6_{4,2}$-$5_{3,2}$	216056.093	26.5	3.73	216056.4	0.26	0.08	CH_3CH_2CN v_{13}/v_{21}
tEME-AE	$6_{4,2}$-$5_{3,2}$	216056.319	26.5	3.73	†			
tEME-EA	$6_{4,3}$-$5_{3,3}$	216058.222	26.5	3.69	216058.4	0.25	0.10	CH_3CH_2CN v_{13}/v_{21}
tEME-EA	$6_{4,2}$-$5_{3,2}$	216058.519	26.5	3.69	†			
tEME-AA	$6_{4,3}$-$5_{3,2}$	216058.597	26.5	3.73	†			
tEME-AA	$6_{4,2}$-$5_{3,3}$	216058.930	26.5	3.73	†			
tEME-EE	$12_{3,9}$-$11_{2,10}$	217007.530	40.5	4.14	217007.7	0.13	0.08	HDCS, CH_3OCOH
tEME-EE'	$12_{3,9}$-$11_{2,10}$	217007.763	40.5	4.12	†			
tEME-AE	$12_{3,9}$-$11_{2,10}$	217007.939	40.5	4.13	†			
tEME-EA	$12_{3,9}$-$11_{2,10}$	217009.762	40.5	4.16	217010.0	0.13	0.05	HDCS, CH_3OCOH
tEME-AA	$12_{3,9}$-$11_{2,10}$	217010.054	40.5	4.16	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-AA	$30_{1,29}$-$29_{2,28}$	217164.465	182.5	13.55	...	...	0.07	CH_3OCOH
tEME-EA	$30_{1,29}$-$29_{2,28}$	217164.508	182.5	13.55	†			
tEME-AE	$30_{1,29}$-$29_{2,28}$	217165.360	182.5	13.55	†			
tEME-EE	$30_{1,29}$-$29_{2,28}$	217165.402	182.5	13.55	†			
tEME-EE'	$30_{1,29}$-$29_{2,28}$	217165.402	182.5	13.55	†			
tEME-AA	$28_{0,28}$-$27_{1,27}$	217940.650	154.7	22.59	217940.7	0.44	0.25	c-C_3H_2, $HCC^{13}CN$ v_7=1, CH_3COOCH_3
tEME-EA	$28_{0,28}$-$27_{1,27}$	217940.651	154.7	22.59	†			
tEME-AE	$28_{0,28}$-$27_{1,27}$	217940.758	154.7	22.59	†			
tEME-EE	$28_{0,28}$-$27_{1,27}$	217940.759	154.7	22.59	†			
tEME-EE'	$28_{0,28}$-$27_{1,27}$	217940.759	154.7	22.59	†			
tEME-EE'	$22_{2,21}$-$21_{1,20}$	219893.140	102.2	8.31	...	...	0.09	SO
tEME-EE	$22_{2,21}$-$21_{1,20}$	219893.140	102.2	8.31	†			
tEME-AE	$22_{2,21}$-$21_{1,20}$	219893.263	102.2	8.31	†			
tEME-EA	$22_{2,21}$-$21_{1,20}$	219894.511	102.2	8.31	...		0.06	SO
tEME-AA	$22_{2,21}$-$21_{1,20}$	219894.635	102.2	8.31	†			
tEME-EE'	$28_{1,28}$-$27_{0,27}$	222861.487	154.8	22.63	222861.3	0.55	0.26	CH_3OCOH
tEME-EE	$28_{1,28}$-$27_{0,27}$	222861.487	154.8	22.63	†			
tEME-AE	$28_{1,28}$-$27_{0,27}$	222861.500	154.8	22.63	†			
tEME-EA	$28_{1,28}$-$27_{0,27}$	222861.655	154.8	22.63	†			
tEME-AA	$28_{1,28}$-$27_{0,27}$	222861.668	154.8	22.63	†			
tEME-EE'	$13_{3,11}$-$12_{2,10}$	222980.574	45.5	4.38	222980.7	0.22	0.09	$CH_3O^{13}COH$
tEME-EE	$13_{3,11}$-$12_{2,10}$	222980.720	45.5	4.39	†			
tEME-AE	$13_{3,11}$-$12_{2,10}$	222980.951	45.5	4.39	†			
tEME-EA	$13_{3,11}$-$12_{2,10}$	222983.368	45.5	4.40	222983.7	0.16	0.06	$CH_3O^{13}COH$
tEME-AA	$13_{3,11}$-$12_{2,10}$	222983.672	45.5	4.40	†			
tEME-EE	$16_{2,14}$-$15_{1,15}$	223403.761	57.4	2.48	...	...	0.04	CH_3OCH_3, CH_3OCOH v_t=1
tEME-EE'	$16_{2,14}$-$15_{1,15}$	223403.762	57.4	2.48	†			
tEME-AE	$16_{2,14}$-$15_{1,15}$	223404.001	57.4	2.48	†			
tEME-EA	$16_{2,14}$-$15_{1,15}$	223405.432	57.4	2.48	...	...	0.03	CH_3OCH_3
tEME-AA	$16_{2,14}$-$15_{1,15}$	223405.671	57.4	2.48	†			
tEME-EE'	$7_{4,4}$-$6_{3,4}$	224103.753	29.2	3.89	224103.98	0.63	0.10	CH_3CH_2CN v_{13}/v_{21}
tEME-EE	$7_{4,4}$-$6_{3,4}$	224104.093	29.2	3.88	†			
tEME-AE	$7_{4,4}$-$6_{3,4}$	224104.315	29.2	3.89	†			
tEME-EE	$7_{4,3}$-$6_{3,3}$	224104.926	29.2	3.88	†			
tEME-EE'	$7_{4,3}$-$6_{3,3}$	224105.266	29.2	3.89	224105.2	0.47	0.10	CH_3CH_2CN v_{20}=1
tEME-AE	$7_{4,3}$-$6_{3,3}$	224105.490	29.2	3.89	†			
tEME-AA	$7_{4,4}$-$6_{3,3}$	224107.456	29.2	3.90	224107.7	0.52	0.10	CH_3CH_2CN v_{20}=1
tEME-EA	$7_{4,4}$-$6_{3,4}$	224107.546	29.2	3.58	†			
tEME-EA	$7_{4,3}$-$6_{3,3}$	224107.581	29.2	3.58	†			
tEME-AA	$7_{4,3}$-$6_{3,4}$	224108.457	29.2	3.90	†			
tEME-EE	$13_{3,10}$-$12_{2,11}$	225283.674	45.5	4.33	...	...	0.09	CH_3CH_2OH
tEME-EE'	$13_{3,10}$-$12_{2,11}$	225283.820	45.5	4.33	†			
tEME-AE	$13_{3,10}$-$12_{2,11}$	225284.043	45.5	4.33	†			
tEME-EA	$13_{3,10}$-$12_{2,11}$	225285.990	45.5	4.34	225286.28	0.29	0.06	CH_3CH_2OH
tEME-AA	$13_{3,10}$-$12_{2,11}$	225286.286	45.5	4.34	†			
tEME-EE'	$23_{2,22}$-$22_{1,21}$	225494.508	111.0	8.90	225494.4	0.12	0.10	
tEME-EE	$23_{2,22}$-$22_{1,21}$	225494.508	111.0	8.90	†			
tEME-AE	$23_{2,22}$-$22_{1,21}$	225494.625	111.0	8.90	†			
tEME-EA	$23_{2,22}$-$22_{1,21}$	225495.848	111.0	8.90	225495.9	0.12	0.07	
tEME-AA	$23_{2,22}$-$22_{1,21}$	225495.965	111.0	8.90	†			
tEME-EA	$29_{0,29}$-$28_{1,28}$	226057.836	165.7	23.62	226057.9	0.65	0.26	CH_3CH_2OH
tEME-AA	$29_{0,29}$-$28_{1,28}$	226057.836	165.7	23.62	†			
tEME-EE	$29_{0,29}$-$28_{1,28}$	226057.928	165.7	23.62	†			
tEME-EE'	$29_{0,29}$-$28_{1,28}$	226057.928	165.7	23.62	†			
tEME-AE	$29_{0,29}$-$28_{1,28}$	226057.928	165.7	23.62	†			
tEME-AA	$31_{1,30}$-$30_{2,29}$	227090.552	194.5	14.51	...	...	0.09	CH_3OH
tEME-EA	$31_{1,30}$-$30_{2,29}$	227090.589	194.5	14.51	†			
tEME-AE	$31_{1,30}$-$30_{2,29}$	227091.390	194.5	14.51	†			
tEME-EE	$31_{1,30}$-$30_{2,29}$	227091.426	194.5	14.51	†			
tEME-EE'	$31_{1,30}$-$30_{2,29}$	227091.426	194.5	14.51	†			
tEME-EE'	$29_{1,29}$-$28_{0,28}$	230291.194	165.8	23.66	...	...	0.27	CH_3OH
tEME-EE	$29_{1,29}$-$28_{0,28}$	230291.194	165.8	23.66	†			
tEME-AE	$29_{1,29}$-$28_{0,28}$	230291.205	165.8	23.66	†			
tEME-EA	$29_{1,29}$-$28_{0,28}$	230291.345	165.8	23.66	†			
tEME-AA	$29_{1,29}$-$28_{0,28}$	230291.357	165.8	23.66	†			
tEME-EE'	$14_{3,12}$-$13_{2,11}$	230486.881	50.9	4.59	...	...	0.09	CO
tEME-EE	$14_{3,12}$-$13_{2,11}$	230486.975	50.9	4.60	†			
tEME-AE	$14_{3,12}$-$13_{2,11}$	230487.227	50.9	4.59	†			
tEME-EA	$14_{3,12}$-$13_{2,11}$	230489.569	50.9	4.60	...	...	0.07	CO
tEME-AA	$14_{3,12}$-$13_{2,11}$	230489.869	50.9	4.60	†			
tEME-EE'	$24_{2,23}$-$23_{1,22}$	231063.540	120.2	9.52	...	...	0.11	OCS
tEME-EE	$24_{2,23}$-$23_{1,22}$	231063.540	120.2	9.52	†			
tEME-AE	$24_{2,23}$-$23_{1,22}$	231063.652	120.2	9.52	†			
tEME-EA	$24_{2,23}$-$23_{1,22}$	231064.846	120.2	9.52	...	...	0.08	OCS
tEME-AA	$24_{2,23}$-$23_{1,22}$	231064.958	120.2	9.52	†			
tEME-EE'	$8_{4,5}$-$7_{3,5}$	232151.207	32.3	4.03	232152.1	0.47	0.11	$^{13}CH_3CN$, CH_3OCOH v_t=1
tEME-EE	$8_{4,5}$-$7_{3,5}$	232151.590	32.3	3.98	†			
tEME-AE	$8_{4,5}$-$7_{3,5}$	232151.787	32.3	4.01	†			
tEME-EE	$8_{4,4}$-$7_{3,4}$	232152.098	32.3	3.98	†			
tEME-EE'	$8_{4,4}$-$7_{3,4}$	232152.480	32.3	4.03	†			
tEME-EA	$8_{4,5}$-$7_{3,4}$	232152.521	32.3	1.00	†			
tEME-AE	$8_{4,4}$-$7_{3,4}$	232152.685	32.3	4.01	†			
tEME-AA	$8_{4,5}$-$7_{3,4}$	232154.033	32.3	4.08	...	...	0.06	$^{13}CH_3CN$, CH_3OCOH v_t=1

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed(1) frequency (MHz)	Observed(1) T_{MB} (K)	Model(2) T_{MB} (K)	Blends
tEME-EA	$8_{4,4}$-$7_{3,4}$	232154.362	32.3	3.08	†			
tEME-EA	$8_{4,5}$-$7_{3,5}$	232155.426	32.3	3.08	†			
tEME-AA	$8_{4,4}$-$7_{3,5}$	232156.540	32.3	4.08	...	...	0.04	$^{13}CH_3CN$, CH_3OCOH v_t=1
tEME-EA	$8_{4,4}$-$7_{3,5}$	232157.268	32.3	1.00	†			
tEME-EE	$14_{3,11}$-$13_{2,12}$	233622.462	51.0	4.51	...	...	0.10	CH_3OCOH v_t=0,1
tEME-EE’	$14_{3,11}$-$13_{2,12}$	233622.556	51.0	4.51	†			
tEME-AE	$14_{3,11}$-$13_{2,12}$	233622.806	51.0	4.51	†			
tEME-EA	$14_{3,11}$-$13_{2,12}$	233624.824	51.0	4.52	...	...	0.06	CH_3OCOH v_t=0,1
tEME-AA	$14_{3,11}$-$13_{2,12}$	233625.121	51.0	4.52	†			
tEME-EA	$30_{0,30}$-$29_{1,29}$	234130.523	177.0	24.66	...	...	0.27	CH_3CH_2CN v_{13}/v_{21}
tEME-AA	$30_{0,30}$-$29_{1,29}$	234130.524	177.0	24.66	†			
tEME-EE	$30_{0,30}$-$29_{1,29}$	234130.601	177.0	24.66	†			
tEME-EE’	$30_{0,30}$-$29_{1,29}$	234130.601	177.0	24.66	†			
tEME-AE	$30_{0,30}$-$29_{1,29}$	234130.602	177.0	24.66	†			
tEME-EE	$17_{2,15}$-$16_{1,16}$	235247.484	64.0	2.37	235247.6	0.09	0.05	
tEME-EE’	$17_{2,15}$-$16_{1,16}$	235247.485	64.0	2.37	†			
tEME-AE	$17_{2,15}$-$16_{1,16}$	235247.731	64.0	2.37	†			
tEME-EA	$17_{2,15}$-$16_{1,16}$	235249.156	64.0	2.37	235249.6	0.14	0.03	U-line
tEME-AA	$17_{2,15}$-$16_{1,16}$	235249.403	64.0	2.37	†			
tEME-EE’	$25_{2,24}$-$24_{1,23}$	236614.358	129.8	10.19	236614.4	0.30	0.11	CH_3COOCH_3
tEME-EE	$25_{2,24}$-$24_{1,23}$	236614.358	129.8	10.19	†			
tEME-AE	$25_{2,24}$-$24_{1,23}$	236614.464	129.8	10.19	†			
tEME-EA	$25_{2,24}$-$24_{1,23}$	236615.628	129.8	10.19	†		0.08	CH_3COOCH_3
tEME-AA	$25_{2,24}$-$24_{1,23}$	236615.733	129.8	10.19	†			
tEME-AA	$32_{1,31}$-$31_{2,30}$	236906.877	206.9	15.50	236907.2	0.30	0.10	CH_3SH, HC_3N v_6=1
tEME-EA	$32_{1,31}$-$31_{2,30}$	236906.908	206.9	15.50	†			
tEME-AE	$32_{1,31}$-$31_{2,30}$	236907.656	206.9	15.50	†			
tEME-EE	$32_{1,31}$-$31_{2,30}$	236907.687	206.9	15.50	†			
tEME-EE’	$32_{1,31}$-$31_{2,30}$	236907.687	206.9	15.50	†			
tEME-EE’	$30_{1,30}$-$29_{0,29}$	237763.517	177.1	24.69	237763.6	0.48	0.28	CH_2CHCN
tEME-EE	$30_{1,30}$-$29_{0,29}$	237763.517	177.1	24.69	†			
tEME-AE	$30_{1,30}$-$29_{0,29}$	237763.527	177.1	24.69	†			
tEME-EA	$30_{1,30}$-$29_{0,29}$	237763.653	177.1	24.69	†			
tEME-AA	$30_{1,30}$-$29_{0,29}$	237763.664	177.1	24.69	†			
tEME-EE’	$15_{3,13}$-$14_{2,12}$	237865.715	56.7	4.79	...	...	0.10	CH_2CHCN
tEME-EE	$15_{3,13}$-$14_{2,12}$	237865.778	56.7	4.80	†			
tEME-AE	$15_{3,13}$-$14_{2,12}$	237866.042	56.7	4.80	†			
tEME-EA	$15_{3,13}$-$14_{2,12}$	237868.339	56.7	4.80	...	...	0.08	CH_2CHCN
tEME-AA	$15_{3,13}$-$14_{2,12}$	237868.635	56.7	4.80	†			
tEME-EA	$9_{4,6}$-$8_{3,5}$	240195.817	35.8	1.64	...	...	0.10	CH_2CHCN v_{15}=1
tEME-EE	$9_{4,5}$-$8_{3,5}$	240196.101	35.8	3.88	†			
tEME-EE’	$9_{4,6}$-$8_{3,6}$	240196.396	35.8	3.88	†			
tEME-EE’	$9_{4,5}$-$8_{3,5}$	240196.642	35.8	3.88	†			
tEME-AE	$9_{4,5}$-$8_{3,5}$	240196.777	35.8	3.88	†			
tEME-EE	$9_{4,6}$-$8_{3,6}$	240196.937	35.8	3.88	†			
tEME-AE	$9_{4,6}$-$8_{3,6}$	240197.045	35.8	3.88	†			
tEME-AA	$9_{4,6}$-$8_{3,5}$	240197.196	35.8	3.88	†			
tEME-EA	$9_{4,5}$-$8_{3,5}$	240197.654	35.8	3.88	†			
tEME-EA	$9_{4,6}$-$8_{3,6}$	240201.478	35.8	2.63	...	...	0.05	CH_2CHCN v_{15}=1
tEME-AA	$9_{4,5}$-$8_{3,6}$	240202.719	35.8	4.28	†			
tEME-EA	$9_{4,5}$-$8_{3,6}$	240203.315	35.8	1.64	†			
tEME-EE	$15_{3,12}$-$14_{2,13}$	242035.318	56.8	4.68	...	...	0.10	CH_2DCN
tEME-EE’	$15_{3,12}$-$14_{2,13}$	242035.380	56.8	4.68	†			
tEME-AE	$15_{3,12}$-$14_{2,13}$	242035.647	56.8	4.68	†			
tEME-EA	$15_{3,12}$-$14_{2,13}$	242037.704	56.8	4.68	...	...	0.07	CH_2DCN
tEME-EA	$15_{3,12}$-$14_{2,13}$	242038.002	56.8	4.68	†			
tEME-EE’	$26_{2,25}$-$25_{1,24}$	242161.785	139.8	10.89	...	...	0.32	CH_3CH_2CN v_{20}=1
tEME-EE	$26_{2,25}$-$25_{1,24}$	242161.785	139.8	10.89	†			
tEME-AE	$26_{2,25}$-$25_{1,24}$	242161.884	139.8	10.89	†			
tEME-EA	$26_{2,25}$-$25_{1,24}$	242163.015	139.8	10.89	†			
tEME-AA	$26_{2,25}$-$25_{1,24}$	242163.114	139.8	10.89	†			
tEME-EA	$31_{0,31}$-$30_{1,30}$	242163.369	188.7	25.69	†			
tEME-AA	$31_{0,31}$-$30_{1,30}$	242163.371	188.7	25.69	†			
tEME-EE	$31_{0,31}$-$30_{1,30}$	242163.434	188.7	25.69	†			
tEME-EE’	$31_{0,31}$-$30_{1,30}$	242163.434	188.7	25.69	†			
tEME-AE	$31_{0,31}$-$30_{1,30}$	242163.436	188.7	25.69	†			
tEME-EE’	$16_{3,14}$-$15_{2,13}$	245103.550	62.9	4.99	...	...	0.10	$CH_3CH_2{}^{13}CN$
tEME-EE	$16_{3,14}$-$15_{2,13}$	245103.592	62.9	4.99	†			
tEME-AE	$16_{3,14}$-$15_{2,13}$	245103.864	62.9	4.99	†			
tEME-EA	$16_{3,14}$-$15_{2,13}$	245106.133	62.9	4.99	245106.4	0.32	0.07	CH_2OHCHO
tEME-AA	$16_{3,14}$-$15_{2,13}$	245106.426	62.9	5.00	†			
tEME-EE’	$31_{1,31}$-$30_{0,30}$	245274.088	188.8	25.71	245274.3	0.40	0.29	$^{34}SO_2$
tEME-EE	$31_{1,31}$-$30_{0,30}$	245274.088	188.8	25.71	†			
tEME-AE	$31_{1,31}$-$30_{0,30}$	245274.098	188.8	25.71	†			
tEME-EA	$31_{1,31}$-$30_{0,30}$	245274.211	188.8	25.71	†			
tEME-AA	$31_{1,31}$-$30_{0,30}$	245274.221	188.8	25.71	†			
tEME-AA	$33_{1,32}$-$32_{2,31}$	246605.346	219.6	16.51	246606.0	0.36	0.11	CH_3OCH_3
tEME-EA	$33_{1,32}$-$32_{2,31}$	246605.372	219.6	16.51	†			
tEME-AE	$33_{1,32}$-$32_{2,31}$	246606.066	219.6	16.51	†			
tEME-EE	$33_{1,32}$-$32_{2,31}$	246606.092	219.6	16.51	†			
tEME-EE’	$33_{1,32}$-$32_{2,31}$	246606.092	219.6	16.51	†			
tEME-EE	$18_{2,16}$-$17_{1,17}$	247478.246	71.1	2.26	247478.0	0.16	0.05	CH_3OCOH v_t=1
tEME-EE’	$18_{2,16}$-$17_{1,17}$	247478.247	71.1	2.26	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed(1) frequency (MHz)	Observed(1) T_{MB} (K)	Model(2) T_{MB} (K)	Blends
tEME-AE	$18_{2,16}$-$17_{1,17}$	247478.501	71.1	2.26	†			
tEME-EA	$18_{2,16}$-$17_{1,17}$	247479.920	71.1	2.26	247480.0	0.16	0.03	CH_3OCOH v_t=1
tEME-AA	$18_{2,16}$-$17_{1,17}$	247480.175	71.1	2.26	†			
tEME-EE’	$27_{2,26}$-$26_{1,25}$	247721.097	150.2	11.63	247721.2	0.23	0.11	
tEME-EE	$27_{2,26}$-$26_{1,25}$	247721.097	150.2	11.63	†			
tEME-AE	$27_{2,26}$-$26_{1,25}$	247721.190	150.2	11.63	†			
tEME-EA	$27_{2,26}$-$26_{1,25}$	247722.285	150.2	11.63	†			
tEME-AA	$27_{2,26}$-$26_{1,25}$	247722.378	150.2	11.63	†			
tEME-EA	$10_{4,7}$-$9_{3,6}$	248234.223	39.7	2.12	248235.7	0.31	0.15	U-line
tEME-EE	$10_{4,6}$-$9_{3,6}$	248235.232	39.7	3.50	†			
tEME-AA	$10_{4,7}$-$9_{3,6}$	248235.506	39.7	4.48	†			
tEME-EA	$10_{4,6}$-$9_{3,6}$	248236.059	39.7	2.36	†			
tEME-AE	$10_{4,6}$-$9_{3,6}$	248236.076	39.7	3.66	†			
tEME-EE’	$10_{4,6}$-$9_{3,6}$	248236.093	39.7	3.79	†			
tEME-EE’	$10_{4,7}$-$9_{3,7}$	248239.115	39.7	3.79	248239.8	0.07	0.09	U-line
tEME-AE	$10_{4,7}$-$9_{3,7}$	248239.913	39.7	3.66	†			
tEME-EE	$10_{4,7}$-$9_{3,7}$	248239.977	39.7	3.50	†			
tEME-EA	$10_{4,7}$-$9_{3,7}$	248245.234	39.7	2.36	...	...	0.06	CH_3COCH_3
tEME-AA	$10_{4,6}$-$9_{3,7}$	248246.569	39.7	4.48	†			
tEME-EA	$10_{4,6}$-$9_{3,7}$	248247.070	39.7	2.12	†			
tEME-EE	$10_{4,6}$-$9_{3,7}$	248248.602	39.7	0.98	†			
tEME-AE	$10_{4,6}$-$9_{3,7}$	248250.368	39.7	0.82	†			
tEME-EE’	$10_{4,6}$-$9_{3,7}$	248251.399	39.7	0.69	†			
tEME-EA	$32_{0,32}$-$31_{1,31}$	250160.753	200.8	26.72	...	...	0.29	$^{34}SO_2$
tEME-AA	$32_{0,32}$-$31_{1,31}$	250160.756	200.8	26.72	†			
tEME-EE	$32_{0,32}$-$31_{1,31}$	250160.807	200.8	26.72	†			
tEME-EE’	$32_{0,32}$-$31_{1,31}$	250160.807	200.8	26.72	†			
tEME-AE	$32_{0,32}$-$31_{1,31}$	250160.810	200.8	26.72	†			
tEME-EE	$16_{3,13}$-$15_{2,14}$	250534.903	62.9	4.83	250535.0	0.16	0.11	
tEME-EE’	$16_{3,13}$-$15_{2,14}$	250534.946	62.9	4.83	†			
tEME-AE	$16_{3,13}$-$15_{2,14}$	250535.223	62.9	4.83	†			
tEME-EA	$16_{3,13}$-$15_{2,14}$	250537.299	62.9	4.83	250537.5	0.11	0.08	
tEME-AA	$16_{3,13}$-$15_{2,14}$	250537.598	62.9	4.83	†			
tEME-EE’	$17_{3,15}$-$16_{2,14}$	252188.288	69.5	5.19	252188.5	0.59	0.11	CH_3CH_2CN v_{13}/v_{21}
tEME-EE	$17_{3,15}$-$16_{2,14}$	252188.318	69.5	5.19	†			
tEME-AE	$17_{3,15}$-$16_{2,14}$	252188.592	69.5	5.19	†			
tEME-EA	$17_{3,15}$-$16_{2,14}$	252190.846	69.5	5.19	...	...	0.08	CH_3CH_2CN v_{13}/v_{21}
tEME-AA	$17_{3,15}$-$16_{2,14}$	252191.135	69.5	5.19	†			
tEME-EE’	$32_{1,32}$-$31_{0,31}$	252818.715	200.8	26.74	...	...	0.29	CH_3OH
tEME-EE	$32_{1,32}$-$31_{0,31}$	252818.715	200.8	26.74	†			
tEME-AE	$32_{1,32}$-$31_{0,31}$	252818.724	200.8	26.74	†			
tEME-EA	$32_{1,32}$-$31_{0,31}$	252818.826	200.8	26.74	†			
tEME-AA	$32_{1,32}$-$31_{0,31}$	252818.835	200.8	26.74	†			
tEME-EE’	$28_{2,27}$-$27_{1,26}$	253307.713	161.0	12.42	...	...	0.12	$^{13}CH_3OH$
tEME-EE	$28_{2,27}$-$27_{1,26}$	253307.713	161.0	12.42	†			
tEME-AE	$28_{2,27}$-$27_{1,26}$	253307.800	161.0	12.42	†			
tEME-EA	$28_{2,27}$-$27_{1,26}$	253308.856	161.0	12.42	†			
tEME-AA	$28_{2,27}$-$27_{1,26}$	253308.943	161.0	12.42	†			
tEME-EE	$5_{5,0}$-$4_{4,0}$	255923.090	34.6	4.50	255923.1	0.42	0.29	CH_3CH_2CN
tEME-EE’	$5_{5,1}$-$4_{4,1}$	255923.151	34.6	4.50	†			
tEME-EE’	$5_{5,0}$-$4_{4,0}$	255923.293	34.6	4.50	†			
tEME-EE	$5_{5,1}$-$4_{4,1}$	255923.354	34.6	4.50	†			
tEME-AE	$5_{5,0}$-$4_{4,0}$	255923.648	34.6	4.50	†			
tEME-AE	$5_{5,1}$-$4_{4,1}$	255923.709	34.6	4.50	†			
tEME-EA	$5_{5,1}$-$4_{4,1}$	255926.362	34.6	4.50	255926.5	0.37	0.20	SO_2
tEME-EA	$5_{5,0}$-$4_{4,0}$	255926.565	34.6	4.50	†			
tEME-AA	$5_{5,1}$-$4_{4,0}$	255926.920	34.6	4.50	†			
tEME-AA	$5_{5,0}$-$4_{4,1}$	255926.920	34.6	4.50	†			
tEME-AA	$34_{1,33}$-$33_{2,32}$	256180.110	232.7	17.54	256180.5	0.28	0.11	CH_3OCOH v_t=1
tEME-EA	$34_{1,33}$-$33_{2,32}$	256180.131	232.7	17.54	†			
tEME-AE	$34_{1,33}$-$33_{2,32}$	256180.771	232.7	17.54	†			
tEME-EE	$34_{1,33}$-$33_{2,32}$	256180.792	232.7	17.54	†			
tEME-EE’	$34_{1,33}$-$33_{2,32}$	256180.792	232.7	17.54	†			
tEME-EA	$11_{4,8}$-$10_{3,7}$	256265.991	43.9	2.59	...	...	0.10	SO_2
tEME-AA	$11_{4,8}$-$10_{3,7}$	256267.169	43.9	4.68	†			
tEME-EE	$11_{4,7}$-$10_{3,7}$	256267.504	43.9	3.09	†			
tEME-EA	$11_{4,7}$-$10_{3,7}$	256267.843	43.9	2.09	†			
tEME-AE	$11_{4,8}$-$10_{3,8}$	256280.321	43.9	3.24	...	...	0.07	CH_3OCOH v_t=1
tEME-EE	$11_{4,8}$-$10_{3,8}$	256280.554	43.9	3.09	†			
tEME-AE	$11_{4,7}$-$10_{3,8}$	256290.759	43.9	1.44	...	...	0.07	CH_3CCH
tEME-EE’	$11_{4,7}$-$10_{3,8}$	256291.611	43.9	1.30	†			
tEME-EA	$33_{0,33}$-$32_{1,32}$	258126.741	213.2	27.74	...	...	0.29	CH_3CN v_8=1, CH_3OCOH
tEME-AA	$33_{0,33}$-$32_{1,32}$	258126.744	213.2	27.74	†			
tEME-EE	$33_{0,33}$-$32_{1,32}$	258126.784	213.2	27.74	†			
tEME-EE’	$33_{0,33}$-$32_{1,32}$	258126.784	213.2	27.74	†			
tEME-AE	$33_{0,33}$-$32_{1,32}$	258126.787	213.2	27.74	†			
tEME-EE’	$29_{2,28}$-$28_{1,27}$	258936.835	172.1	13.24	...	...	0.12	SO_2
tEME-EE	$29_{2,28}$-$28_{1,27}$	258936.835	172.1	13.24	†			
tEME-AE	$29_{2,28}$-$28_{1,27}$	258936.915	172.1	13.24	†			
tEME-EA	$29_{2,28}$-$28_{1,27}$	258937.931	172.1	13.24	†			
tEME-AA	$29_{2,28}$-$28_{1,27}$	258938.012	172.1	13.24	†			
tEME-EE’	$18_{3,16}$-$17_{2,15}$	259109.696	76.5	5.39	...	...	0.11	CH_3OCOH
tEME-EE	$18_{3,16}$-$17_{2,15}$	259109.717	76.5	5.39	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-AE	$18_{3,16}$-$17_{2,15}$	259109.992	76.5	5.39	†			
tEME-EA	$18_{3,16}$-$17_{2,15}$	259112.236	76.5	5.39	...	...	0.08	CH_3OCOH
tEME-AA	$18_{3,16}$-$17_{2,15}$	259112.522	76.5	5.39	†			
tEME-EE	$17_{3,14}$-$16_{2,15}$	259135.164	69.5	4.97	...	...	0.11	CH_3OCOH
tEME-EE'	$17_{3,14}$-$16_{2,15}$	259135.193	69.5	4.97	†			
tEME-AE	$17_{3,14}$-$16_{2,15}$	259135.477	69.5	4.97	†			
tEME-EA	$17_{3,14}$-$16_{2,15}$	259137.561	69.5	4.97	...	...	0.08	CH_3OCOH
tEME-AA	$17_{3,14}$-$16_{2,15}$	259137.860	69.5	4.97	†			
tEME-EE	$19_{2,17}$-$18_{1,18}$	260106.865	78.5	2.13	...	...	0.05	CH_3CH_2OH
tEME-EE'	$19_{2,17}$-$18_{1,18}$	260106.865	78.5	2.13	†			
tEME-AE	$19_{2,17}$-$18_{1,18}$	260107.129	78.5	2.13	†			
tEME-EA	$19_{2,17}$-$18_{1,18}$	260108.541	78.5	2.13	...	...	0.05	CH_3CH_2OH
tEME-AA	$19_{2,17}$-$18_{1,18}$	260108.805	78.5	2.13	†			
tEME-EE'	$33_{1,33}$-$32_{0,32}$	260393.451	213.3	27.76	...	...	0.29	CH_3OCOH
tEME-EE	$33_{1,33}$-$32_{0,32}$	260393.451	213.3	27.76	†			
tEME-AE	$33_{1,33}$-$32_{0,32}$	260393.460	213.3	27.76	†			
tEME-EA	$33_{1,33}$-$32_{0,32}$	260393.552	213.3	27.76	†			
tEME-AA	$33_{1,33}$-$32_{0,32}$	260393.560	213.3	27.76	†			
tEME-EE'	$40_{6,35}$-$40_{5,36}$	260504.644	358.5	20.96	...	...		SiO
tEME-EE	$40_{6,35}$-$40_{5,36}$	260505.033	358.5	21.22	†			
tEME-AE	$40_{6,35}$-$40_{5,36}$	260505.210	358.5	21.10	†			
tEME-EA	$40_{6,35}$-$40_{5,36}$	260507.959	358.5	21.43	†			
tEME-AA	$40_{6,35}$-$40_{5,36}$	260508.333	358.5	21.45	†			
tEME-EE	$38_{6,32}$-$38_{5,33}$	260681.821	327.9	19.53	...	...	0.03	CH_3CH_2CN
tEME-AE	$38_{6,32}$-$38_{5,33}$	260682.506	327.9	19.20	†			
tEME-EE'	$38_{6,32}$-$38_{5,33}$	260682.515	327.9	18.84	†			
tEME-EA	$38_{6,32}$-$38_{5,33}$	260683.965	327.9	20.17	†			
tEME-AA	$38_{6,32}$-$38_{5,33}$	260684.291	327.9	20.22	†			
tEME-EE	$37_{6,31}$-$37_{5,32}$	261001.915	313.2	18.45	...	...	0.03	$OC^{34}S$, CH_3OCOH
tEME-AE	$37_{6,31}$-$37_{5,32}$	261002.704	313.2	17.96	†			
tEME-EE'	$37_{6,31}$-$37_{5,32}$	261002.807	313.2	17.46	†			
tEME-EE'	$38_{6,33}$-$38_{5,34}$	261029.561	327.9	18.84	261030.4	0.27	0.03	CH_3OCOH v_t=1
tEME-EE	$38_{6,33}$-$38_{5,34}$	261030.255	327.9	19.53	†			
tEME-AE	$38_{6,33}$-$38_{5,34}$	261030.302	327.9	19.20	†			
tEME-EA	$38_{6,33}$-$38_{5,34}$	261033.470	327.9	20.16	...	...	0.03	CH_3OCOH
tEME-AA	$38_{6,33}$-$38_{5,34}$	261033.876	327.9	20.22	†			
tEME-EE'	$37_{6,32}$-$37_{5,33}$	261270.008	313.2	17.46	...	...	0.03	CH_3CH_2CN v_{13}/v_{21}
tEME-AE	$37_{6,32}$-$37_{5,33}$	261270.856	313.2	17.95	†			
tEME-EE	$37_{6,32}$-$37_{5,33}$	261270.899	313.2	18.45	†			
tEME-AE	$36_{6,30}$-$36_{5,31}$	261291.812	298.9	16.50	...	...	0.04	CH_3CH_2OH
tEME-EE'	$36_{6,30}$-$36_{5,31}$	261292.008	298.9	15.92	†			
tEME-EA	$36_{6,30}$-$36_{5,31}$	261292.672	298.9	18.82	†			
tEME-AA	$36_{6,30}$-$36_{5,31}$	261292.970	298.9	19.00	†			
tEME-AE	$36_{6,31}$-$36_{5,32}$	261496.448	298.9	16.50	...	...	0.03	CH_2CN
tEME-EE	$36_{6,31}$-$36_{5,32}$	261496.589	298.9	17.15	†			
tEME-EA	$36_{6,31}$-$36_{5,32}$	261500.259	298.9	18.82	...	...	0.03	CH_3OCOH, CH_2CN
tEME-AA	$36_{6,31}$-$36_{5,32}$	261500.719	298.9	19.00	†			
tEME-EE'	$35_{6,29}$-$35_{5,30}$	261553.036	285.0	14.38	261553.2	0.15	0.06	$CH_3O^{13}COH$ v_t=1
tEME-EA	$35_{6,29}$-$35_{5,30}$	261553.277	285.0	18.06	†			
tEME-AA	$35_{6,29}$-$35_{5,30}$	261553.546	285.0	18.40	†			
tEME-AE	$35_{6,30}$-$35_{5,31}$	261707.095	285.0	14.94	...	...	0.03	CH_3OH
tEME-EE	$35_{6,30}$-$35_{5,31}$	261707.325	285.0	15.65	†			
tEME-EA	$35_{6,30}$-$35_{5,31}$	261711.277	285.0	18.06	...	...	0.03	CH_3OCOH
tEME-AA	$35_{6,30}$-$35_{5,31}$	261711.778	285.0	18.40	†			
tEME-EE	$34_{6,28}$-$34_{5,29}$	261787.091	271.4	14.12	...	...	0.07	CH_3OCOH, CH_3OH, SO
tEME-AE	$34_{6,28}$-$34_{5,29}$	261788.168	271.4	13.47	†			
tEME-EA	$34_{6,28}$-$34_{5,29}$	261788.351	271.4	17.16	†			
tEME-EE'	$34_{6,28}$-$34_{5,29}$	261788.486	271.4	13.02	†			
tEME-AA	$34_{6,28}$-$34_{5,29}$	261788.577	271.4	17.80	†			
tEME-EE'	$34_{6,29}$-$34_{5,30}$	261901.878	271.4	13.02	...	...	0.03	CH_3OCH_3, CH_3COCH_3
tEME-AE	$34_{6,29}$-$34_{5,30}$	261902.977	271.4	13.47	†			
tEME-EE	$34_{6,29}$-$34_{5,30}$	261903.273	271.4	14.12	†			
tEME-EA	$34_{6,29}$-$34_{5,30}$	261907.508	271.4	17.16	...	...	0.03	CH_3OCH_3, CH_3COCH_3
tEME-AA	$34_{6,29}$-$34_{5,30}$	261908.064	271.4	17.80	†			
tEME-EA	$33_{6,27}$-$33_{5,29}$	262000.261	258.3	16.05	...	...	0.08	CCH
tEME-AE	$33_{6,27}$-$33_{5,29}$	262000.337	258.3	12.24	†			
tEME-AA	$33_{6,27}$-$33_{5,29}$	262000.424	258.3	17.21	†			
tEME-EE'	$33_{6,27}$-$33_{5,29}$	262000.673	258.3	11.95	†			
tEME-AE	$33_{6,27}$-$33_{5,29}$	262084.400	258.3	12.24	...	...	0.03	CH_3OCOH
tEME-EE	$33_{6,27}$-$33_{5,29}$	262084.731	258.3	12.72	†			
tEME-EA	$33_{6,27}$-$33_{5,29}$	262089.211	258.3	16.05	...	...	0.03	CH_3OCOH
tEME-AA	$33_{6,27}$-$33_{5,29}$	262089.841	258.3	17.21	†			
tEME-EA	$32_{6,27}$-$32_{5,28}$	262191.119	245.5	14.67	...	...	0.08	CH_3CH_2CN
tEME-AA	$32_{6,26}$-$32_{5,28}$	262191.200	245.5	16.62	†			
tEME-AE	$32_{6,26}$-$32_{5,28}$	262191.354	245.5	11.34	†			
tEME-EE'	$32_{6,26}$-$32_{5,28}$	262191.682	245.5	11.22	†			
tEME-AE	$32_{6,27}$-$32_{5,28}$	262251.766	245.5	11.34	...	...	0.04	SO_2
tEME-EE	$32_{6,27}$-$32_{5,28}$	262252.104	245.5	11.61	†			
tEME-EA	$32_{6,27}$-$32_{5,28}$	262256.756	245.5	14.67	...	...	0.04	SO_2
tEME-AA	$32_{6,27}$-$32_{5,28}$	262257.479	245.5	16.62	†			
tEME-AE	$32_{6,26}$-$32_{5,28}$	262260.269	245.5	5.28	†			
tEME-EE'	$32_{6,26}$-$32_{5,28}$	262260.849	245.5	5.41	†			
tEME-AA	$31_{6,25}$-$31_{5,26}$	262362.797	233.1	16.04	...	...	0.08	$CH_3{}^{13}CH_2CN$

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-EA	$31_{6,25}$-$31_{5,26}$	262362.814	233.1	13.11	†			
tEME-AE	$31_{6,25}$-$31_{5,26}$	262363.092	233.1	10.77	†			
tEME-EE'	$31_{6,25}$-$31_{5,26}$	262363.388	233.1	10.80	†			
tEME-EE'	$31_{6,26}$-$31_{5,27}$	262404.436	233.1	10.80	...	...	0.04	$^{13}CH_3OCOH$ v_t=1
tEME-AE	$31_{6,26}$-$31_{5,27}$	262405.547	233.1	10.77	†			
tEME-EE	$31_{6,25}$-$31_{5,27}$	262405.867	233.1	10.84	†			
tEME-EA	$31_{6,26}$-$31_{5,27}$	262410.601	233.1	13.11	...	...	0.04	$^{13}CH_3OCOH$ v_t=1
tEME-AA	$31_{6,26}$-$31_{5,27}$	262411.432	233.1	16.04	†			
tEME-EA	$30_{6,25}$-$30_{5,25}$	262515.014	221.2	3.88	...	...	0.09	U-line
tEME-EE	$30_{6,24}$-$30_{5,25}$	262516.140	221.2	10.39	†			
tEME-AA	$30_{6,24}$-$30_{5,25}$	262516.918	221.2	15.45	†			
tEME-EA	$30_{6,24}$-$30_{5,25}$	262517.034	221.2	11.57	†			
tEME-AE	$30_{6,24}$-$30_{5,25}$	262517.242	221.2	10.51	†			
tEME-EE'	$30_{6,24}$-$30_{5,25}$	262517.483	221.2	10.68	†			
tEME-EE'	$30_{6,25}$-$30_{5,26}$	262545.215	221.2	10.68	...	...	0.04	H_2CCO
tEME-AE	$30_{6,25}$-$30_{5,26}$	262546.281	221.2	10.51	†			
tEME-EE	$30_{6,25}$-$30_{5,26}$	262546.558	221.2	10.39	†			
tEME-EA	$30_{6,25}$-$30_{5,26}$	262551.283	221.2	11.57	...	...	0.04	H_2CCO
tEME-AA	$30_{6,25}$-$30_{5,26}$	262552.224	221.2	15.45	†			
tEME-EE	$30_{6,24}$-$30_{5,26}$	262553.207	221.2	5.06	†			
tEME-EA	$30_{6,24}$-$30_{5,26}$	262553.303	221.2	3.88	†			
tEME-EE	$29_{6,23}$-$29_{5,24}$	262654.283	209.6	10.25	...	...	0.10	CH_3COCH_3
tEME-AA	$29_{6,23}$-$29_{5,24}$	262655.095	209.6	14.87	†			
tEME-EA	$29_{6,23}$-$29_{5,24}$	262655.300	209.6	10.29	†			
tEME-AE	$29_{6,23}$-$29_{5,24}$	262655.326	209.6	10.53	†			
tEME-EE'	$29_{6,23}$-$29_{5,24}$	262655.485	209.6	10.83	†			
tEME-EE'	$29_{6,24}$-$29_{5,25}$	262673.561	209.6	10.83	...	...	0.05	$HC^{13}CCN$
tEME-AE	$29_{6,24}$-$29_{5,25}$	262674.556	209.6	10.53	†			
tEME-EE	$29_{6,24}$-$29_{5,25}$	262674.763	209.6	10.25	†			
tEME-EA	$29_{6,24}$-$29_{5,25}$	262679.394	209.6	10.29	...	...	0.04	$HC^{13}CCN$
tEME-AA	$29_{6,24}$-$29_{5,25}$	262680.434	209.6	14.87	†			
tEME-EA	$29_{6,23}$-$29_{5,25}$	262681.315	209.6	4.58	†			
tEME-EE	$29_{6,23}$-$29_{5,25}$	262681.410	209.6	4.63	†			
tEME-EA	$28_{6,23}$-$28_{5,23}$	262777.103	198.3	4.94	...	...	0.10	CH_3OCH_3
tEME-EE	$28_{6,22}$-$28_{5,23}$	262777.763	198.3	10.37	†			
tEME-AA	$28_{6,22}$-$28_{5,23}$	262778.714	198.3	14.30	†			
tEME-AE	$28_{6,22}$-$28_{5,23}$	262778.719	198.3	10.78	†			
tEME-EE'	$28_{6,22}$-$28_{5,23}$	262778.771	198.3	11.17	†			
tEME-EA	$28_{6,22}$-$28_{5,23}$	262778.988	198.3	9.35	†			
tEME-EE'	$28_{6,23}$-$28_{5,24}$	262790.103	198.3	11.17	262791.0	0.25	0.05	U-line
tEME-AE	$28_{6,23}$-$28_{5,24}$	262791.000	198.3	10.78	†			
tEME-EE	$28_{6,23}$-$28_{5,24}$	262791.111	198.3	10.37	†			
tEME-EA	$28_{6,23}$-$28_{5,24}$	262795.561	198.3	9.35	...	...	0.04	CH_2OHCHO
tEME-AA	$28_{6,23}$-$28_{5,24}$	262796.681	198.3	14.30	†			
tEME-EA	$28_{6,22}$-$28_{5,24}$	262797.446	198.3	4.94	†			
tEME-EE	$28_{6,22}$-$28_{5,24}$	262797.772	198.3	3.92	†			
tEME-EA	$27_{6,22}$-$27_{5,22}$	262887.474	187.5	4.97	...	...	0.10	CH_3COOH, CH_3OCH_3
tEME-EE	$27_{6,21}$-$27_{5,22}$	262887.831	187.5	10.70	†			
tEME-EE'	$27_{6,21}$-$27_{5,22}$	262888.603	187.5	11.58	†			
tEME-AE	$27_{6,21}$-$27_{5,22}$	262888.676	187.5	11.18	†			
tEME-AA	$27_{6,21}$-$27_{5,22}$	262889.035	187.5	13.72	†			
tEME-EA	$27_{6,21}$-$27_{5,22}$	262889.353	187.5	8.75	†			
tEME-EE'	$27_{6,22}$-$27_{5,23}$	262895.483	187.5	11.58	...	...	0.07	CH_3OCH_3
tEME-EE	$27_{6,22}$-$27_{5,23}$	262896.256	187.5	10.70	†			
tEME-AE	$27_{6,22}$-$27_{5,23}$	262896.265	187.5	11.18	†			
tEME-EA	$27_{6,22}$-$27_{5,23}$	262900.436	187.5	8.75	...	...	0.05	CH_3COOH
tEME-AA	$27_{6,22}$-$27_{5,23}$	262901.609	187.5	13.72	†			
tEME-EA	$27_{6,21}$-$27_{5,23}$	262902.316	187.5	4.97	†			
tEME-EE	$27_{6,21}$-$27_{5,23}$	262902.939	187.5	3.02	†			
tEME-EE	$26_{6,20}$-$26_{5,21}$	262985.638	177.1	11.11	...	...	0.10	$CH_3{}^{18}OH$
tEME-EA	$26_{6,21}$-$26_{5,21}$	262985.653	177.1	4.68	†			
tEME-EE'	$26_{6,20}$-$26_{5,21}$	262986.169	177.1	11.87	†			
tEME-AE	$26_{6,20}$-$26_{5,21}$	262986.363	177.1	11.54	†			
tEME-AA	$26_{6,20}$-$26_{5,21}$	262987.205	177.1	13.15	†			
tEME-EA	$26_{6,20}$-$26_{5,21}$	262987.541	177.1	8.47	†			
tEME-EE'	$26_{6,21}$-$26_{5,22}$	262990.328	177.1	11.87	...	...	0.09	$CH_3{}^{18}OH$
tEME-EE	$26_{6,21}$-$26_{5,22}$	262990.859	177.1	11.11	†			
tEME-AE	$26_{6,21}$-$26_{5,22}$	262990.997	177.1	11.54	†			
tEME-EA	$26_{6,21}$-$26_{5,22}$	262994.684	177.1	8.47	...	...	0.05	SO_2 v_2=1
tEME-AA	$26_{6,21}$-$26_{5,22}$	262995.883	177.1	13.15	†			
tEME-EA	$26_{6,20}$-$26_{5,22}$	262996.572	177.1	4.68	†			
tEME-EE	$26_{6,20}$-$26_{5,22}$	262997.567	177.1	2.04	†			
tEME-EE	$25_{6,19}$-$25_{5,20}$	263072.263	167.0	11.39	...	...	0.11	U-line
tEME-EE'	$25_{6,19}$-$25_{5,20}$	263072.594	167.0	11.92	†			
tEME-EA	$25_{6,20}$-$25_{5,20}$	263072.699	167.0	4.12	†			
tEME-AE	$25_{6,19}$-$25_{5,20}$	263072.885	167.0	11.70	†			
tEME-AA	$25_{6,19}$-$25_{5,20}$	263074.277	167.0	12.58	...	...	0.11	U-line
tEME-EA	$25_{6,19}$-$25_{5,20}$	263074.602	167.0	8.46	†			
tEME-EE'	$25_{6,20}$-$25_{5,21}$	263075.234	167.0	11.92	†			
tEME-EE	$25_{6,20}$-$25_{5,21}$	263075.564	167.0	11.39	†			
tEME-AE	$25_{6,20}$-$25_{5,21}$	263075.815	167.0	11.70	†			
tEME-EA	$25_{6,20}$-$25_{5,21}$	263078.980	167.0	8.46	...	...	0.05	U-line
tEME-AA	$25_{6,20}$-$25_{5,21}$	263080.176	167.0	12.58	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed(1) frequency (MHz)	Observed(1) T_{MB} (K)	Model(2) T_{MB} (K)	Blends
tEME-EE	$24_{6,19}$-$24_{5,19}$	263141.974	157.4	0.60	263149.1	0.44	0.11	$CH_3O^{13}COH$,CH_3OCOD
tEME-EE	$24_{6,18}$-$24_{5,19}$	263148.731	157.4	11.41	†			
tEME-EE'	$24_{6,18}$-$24_{5,19}$	263148.928	157.4	11.70	†			
tEME-AE	$24_{6,18}$-$24_{5,19}$	263149.281	157.4	11.59	†			
tEME-EA	$24_{6,19}$-$24_{5,19}$	263149.579	157.4	3.30	†			
tEME-EE'	$24_{6,19}$-$24_{5,20}$	263150.791	157.4	11.70	263151.0	0.58	0.20	$CH_3O^{13}COH$,CH_3OCOD
tEME-EE	$24_{6,19}$-$24_{5,20}$	263150.988	157.4	11.41	†			
tEME-AA	$24_{6,18}$-$24_{5,19}$	263151.216	157.4	12.01	†			
tEME-AE	$24_{6,19}$-$24_{5,20}$	263151.318	157.4	11.59	†			
tEME-EA	$24_{6,18}$-$24_{5,19}$	263151.498	157.4	8.71	†			
tEME-EA	$24_{6,19}$-$24_{5,20}$	263153.999	157.4	8.71	†			
tEME-AA	$24_{6,19}$-$24_{5,20}$	263155.161	157.4	12.01	263155.2	0.25	0.05	CH_3OCOD
tEME-EA	$24_{6,18}$-$24_{5,20}$	263155.918	157.4	3.30	†			
tEME-EE	$23_{6,17}$-$23_{5,18}$	263215.996	148.1	11.17	263216.3	0.58	0.14	SO_2
tEME-EE'	$23_{6,17}$-$23_{5,18}$	263216.118	148.1	11.31	†			
tEME-AE	$23_{6,17}$-$23_{5,18}$	263216.506	148.1	11.26	†			
tEME-EA	$23_{6,18}$-$23_{5,18}$	263217.183	148.1	2.31	263217.8	0.59	0.14	SO_2
tEME-EE'	$23_{6,18}$-$23_{5,19}$	263217.615	148.1	11.31	†			
tEME-EE	$23_{6,18}$-$23_{5,19}$	263217.736	148.1	11.17	†			
tEME-AE	$23_{6,18}$-$23_{5,19}$	263218.114	148.1	11.26	†			
tEME-AA	$23_{6,17}$-$23_{5,18}$	263218.914	148.1	11.44	†			
tEME-EA	$23_{6,17}$-$23_{5,18}$	263219.118	148.1	9.14	†			
tEME-EA	$23_{6,18}$-$23_{5,19}$	263220.415	148.1	9.14	...	...	0.05	SO_2
tEME-AA	$23_{6,18}$-$23_{5,19}$	263221.507	148.1	11.44	†			
tEME-EA	$23_{6,17}$-$23_{5,19}$	263222.351	148.1	2.31	†			
tEME-EE	$22_{6,16}$-$22_{5,17}$	263274.922	139.2	10.76	...	...	0.14	CH_3OCH_3
tEME-EE'	$22_{6,16}$-$22_{5,17}$	263275.007	139.2	10.82	†			
tEME-AE	$22_{6,16}$-$22_{5,17}$	263275.415	139.2	10.80	†			
tEME-EA	$22_{6,17}$-$22_{5,17}$	263276.341	139.2	1.34	†			
tEME-EE'	$22_{6,17}$-$22_{5,18}$	263276.343	139.2	10.82	†			
tEME-EE	$22_{6,17}$-$22_{5,18}$	263276.429	139.2	10.76	†			
tEME-AE	$22_{6,17}$-$22_{5,18}$	263276.831	139.2	10.80	†			
tEME-AA	$22_{6,16}$-$22_{5,17}$	263278.199	139.2	10.88	...	...	0.11	CH_3OCH_3
tEME-EA	$22_{6,16}$-$22_{5,17}$	263278.292	139.2	9.53	†			
tEME-EA	$22_{6,17}$-$22_{5,18}$	263278.882	139.2	9.53	†			
tEME-AA	$22_{6,17}$-$22_{5,18}$	263279.871	139.2	10.88	†			
tEME-EE	$21_{6,15}$-$21_{5,16}$	263326.288	130.7	10.27	263326.7	0.42	0.14	HC_3N v_7=1, CH_3COCH_3
tEME-EE'	$21_{6,15}$-$21_{5,16}$	263326.357	130.7	10.29	†			
tEME-AE	$21_{6,15}$-$21_{5,16}$	263326.775	130.7	10.28	†			
tEME-EE'	$21_{6,16}$-$21_{5,17}$	263327.628	130.7	10.29	263327.4	0.51	0.14	HC_3N v_7=1, CH_3COCH_3
tEME-EE	$21_{6,16}$-$21_{5,17}$	263327.697	130.7	10.27	†			
tEME-EA	$21_{6,16}$-$21_{5,16}$	263327.838	130.7	.64	†			
tEME-AE	$21_{6,16}$-$21_{5,17}$	263328.113	130.7	10.28	†			
tEME-EA	$21_{6,15}$-$21_{5,16}$	263329.805	130.7	9.67	263329.9	0.74	0.30	HC_3N v_7=1, CH_3COCH_3
tEME-AA	$21_{6,15}$-$21_{5,16}$	263329.839	130.7	10.31	†			
tEME-EA	$21_{6,16}$-$21_{5,17}$	263330.025	130.7	9.67	†			
tEME-AA	$21_{6,16}$-$21_{5,17}$	263330.894	130.7	10.31	†			
tEME-EE	$20_{6,14}$-$20_{5,15}$	263370.802	122.6	9.73	263370.7	0.51	0.16	$SO^{18}O$, CH_3OCOH
tEME-EE'	$20_{6,14}$-$20_{5,15}$	263370.865	122.6	9.74	†			
tEME-AE	$20_{6,14}$-$20_{5,15}$	263371.289	122.6	9.73	†			
tEME-EE'	$20_{6,15}$-$20_{5,16}$	263372.112	122.6	9.74	263372.2	0.37	0.16	$SO^{18}O$, CH_3OCOH
tEME-EE	$20_{6,15}$-$20_{5,16}$	263372.174	122.6	9.73	†			
tEME-AE	$20_{6,15}$-$20_{5,16}$	263372.598	122.6	9.73	†			
tEME-EA	$20_{6,14}$-$20_{5,15}$	263374.395	122.6	9.49	...	...	0.17	$SO^{18}O$, CH_3OCOH
tEME-EA	$20_{6,15}$-$20_{5,16}$	263374.447	122.6	9.49	†			
tEME-AA	$20_{6,14}$-$20_{5,15}$	263374.550	122.6	9.74	†			
tEME-AA	$20_{6,15}$-$20_{5,16}$	263375.201	122.6	9.74	†			
tEME-EE	$19_{6,13}$-$20_{5,14}$	263409.117	114.8	9.17	...	...	0.17	CH_3OCH_3
tEME-EE'	$19_{6,13}$-$20_{5,14}$	263409.177	114.8	9.17	†			
tEME-AE	$19_{6,13}$-$20_{5,14}$	263409.605	114.8	9.17	†			
tEME-EE'	$19_{6,14}$-$20_{5,15}$	263410.419	114.8	9.17	†			
tEME-EE	$19_{6,14}$-$20_{5,15}$	263410.479	114.8	9.17	†			
tEME-AE	$19_{6,14}$-$20_{5,15}$	263410.907	114.8	9.17	†			
tEME-EA	$19_{6,14}$-$20_{5,15}$	263412.731	114.8	9.09	...	...	0.19	CH_3OCH_3
tEME-EA	$19_{6,13}$-$20_{5,14}$	263412.749	114.8	9.09	†			
tEME-AA	$19_{6,13}$-$20_{5,14}$	263413.003	114.8	9.18	†			
tEME-EE	$18_{6,12}$-$18_{5,13}$	263441.843	107.5	8.61	...	...	0.17	$^{34}SO_2$, $^{33}SO_2$
tEME-EE'	$18_{6,12}$-$18_{5,13}$	263441.902	107.5	8.61	†			
tEME-AE	$18_{6,12}$-$18_{5,13}$	263442.334	107.5	8.61	†			
tEME-EE'	$18_{6,13}$-$18_{5,14}$	263443.145	107.5	8.61	†			
tEME-EE	$18_{6,13}$-$18_{5,14}$	263443.204	107.5	8.61	†			
tEME-AE	$18_{6,13}$-$18_{5,14}$	263443.636	107.5	8.61	†			
tEME-EA	$18_{6,13}$-$18_{5,14}$	263445.453	107.5	8.58	...	...	0.19	$^{34}SO_2$, $^{33}SO_2$
tEME-EA	$18_{6,12}$-$18_{5,13}$	263445.498	107.5	8.58	†			
tEME-AA	$18_{6,12}$-$18_{5,13}$	263445.822	107.5	8.61	†			
tEME-AA	$18_{6,13}$-$18_{5,14}$	263446.051	107.5	8.61	†			
tEME-EE	$17_{6,11}$-$17_{5,12}$	263469.553	100.5	8.04	263469.7	0.43	0.17	CH_3CH_2OH
tEME-EE'	$17_{6,11}$-$17_{5,12}$	263469.612	100.5	8.04	†			
tEME-AE	$17_{6,11}$-$17_{5,12}$	263470.047	100.5	8.04	†			
tEME-EE'	$17_{6,12}$-$17_{5,13}$	263470.859	100.5	8.04	†			
tEME-EE	$17_{6,12}$-$17_{5,13}$	263470.917	100.5	8.04	†			
tEME-AE	$17_{6,12}$-$17_{5,13}$	263471.352	100.5	8.04	†			
tEME-EA	$17_{6,12}$-$17_{5,13}$	263473.169	100.5	8.03	263473.9	0.41	0.19	CH_3CH_2OH

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-EA	$17_{6,11}$-$17_{5,12}$	263473.223	100.5	8.03	†			
tEME-AA	$17_{6,11}$-$17_{5,12}$	263473.595	100.5	8.04	†			
tEME-AA	$17_{6,12}$-$17_{5,13}$	263473.725	100.5	8.04	†			
tEME-EE	$16_{6,10}$-$16_{5,11}$	263492.786	94.0	7.46	263492.9	0.26	0.17	CH_3OCH_3
tEME-EE'	$16_{6,10}$-$16_{5,11}$	263492.845	94.0	7.46	†			
tEME-AE	$16_{6,10}$-$16_{5,11}$	263493.283	94.0	7.46	†			
tEME-EE'	$16_{6,11}$-$16_{5,12}$	263494.096	94.0	7.46	263494.2	0.33	0.17	CH_3OCH_3
tEME-EE	$16_{6,11}$-$16_{5,12}$	263494.155	94.0	7.46	†			
tEME-AE	$16_{6,11}$-$16_{5,12}$	263494.592	94.0	7.46	†			
tEME-EA	$16_{6,11}$-$16_{5,12}$	263496.411	94.0	7.46	263496.6	0.55	0.19	CH_3OCH_3
tEME-EA	$16_{6,10}$-$16_{5,11}$	263496.468	94.0	7.46	†			
tEME-AA	$16_{6,10}$-$16_{5,11}$	263496.871	94.0	7.46	†			
tEME-AA	$16_{6,11}$-$16_{5,12}$	263496.942	94.0	7.46	†			
tEME-EE	$15_{6,9}$-$15_{5,10}$	263512.049	87.8	6.89	...	...	0.17	CH_3OCH_3
tEME-EE'	$15_{6,9}$-$15_{5,10}$	263512.108	87.8	6.89	†			
tEME-AE	$15_{6,9}$-$15_{5,10}$	263512.548	87.8	6.89	†			
tEME-EE'	$15_{6,10}$-$15_{5,11}$	263513.363	87.8	6.89	...	...	0.17	CH_3OCH_3
tEME-EE	$15_{6,10}$-$15_{5,11}$	263513.422	87.8	6.89	†			
tEME-AE	$15_{6,10}$-$15_{5,10}$	263513.862	87.8	6.89	†			
tEME-EA	$15_{6,10}$-$15_{5,11}$	263515.683	87.8	6.88	...	...	0.19	CH_3CH_2CN
tEME-EA	$15_{6,9}$-$15_{5,10}$	263515.742	87.8	6.88	†			
tEME-AA	$15_{6,9}$-$15_{5,10}$	263516.163	87.8	6.89	†			
tEME-AA	$15_{6,10}$-$15_{5,11}$	263516.200	87.8	6.89	†			
tEME-EE	$14_{6,8}$-$14_{5,9}$	263527.818	82.0	6.30	...	...	0.16	CH_3OCH_3, CH_3CH_2CN
tEME-EE'	$14_{6,8}$-$14_{5,9}$	263527.877	82.0	6.30	†			
tEME-AE	$14_{6,8}$-$14_{5,9}$	263528.319	82.0	6.30	†			
tEME-EE'	$14_{6,9}$-$14_{5,10}$	263529.136	82.0	6.30	†			
tEME-EE	$14_{6,9}$-$14_{5,10}$	263529.195	82.0	6.30	†			
tEME-AE	$14_{6,9}$-$14_{5,10}$	263529.637	82.0	6.30	†			
tEME-EA	$14_{6,9}$-$14_{5,10}$	263531.461	82.0	6.30	...	...	0.18	CH_3OCH_3
tEME-EA	$14_{6,8}$-$14_{5,9}$	263531.520	82.0	6.30	†			
tEME-AA	$14_{6,8}$-$14_{5,9}$	263531.953	82.0	6.30	†			
tEME-AA	$14_{6,9}$-$14_{5,10}$	263531.971	82.0	6.30	†			
tEME-EE	$13_{6,7}$-$13_{5,8}$	263540.536	76.6	5.71	...	...	0.15	NH_2CHO, SO_2
tEME-EE'	$13_{6,7}$-$13_{5,8}$	263540.595	76.6	5.71	†			
tEME-AE	$13_{6,7}$-$13_{5,8}$	263541.040	76.6	5.71	†			
tEME-EE'	$13_{6,8}$-$13_{5,9}$	263541.858	76.6	5.71	†			
tEME-EE	$13_{6,8}$-$13_{5,9}$	263541.917	76.6	5.71	†			
tEME-AE	$13_{6,8}$-$13_{5,9}$	263542.362	76.6	5.71	†			
tEME-EA	$13_{6,8}$-$13_{5,9}$	263544.188	76.6	5.71	...	...	0.18	NH_2CHO, SO_2
tEME-EA	$13_{6,7}$-$13_{5,8}$	263544.247	76.6	5.71	†			
tEME-AA	$13_{6,7}$-$13_{5,8}$	263544.687	76.6	5.71	†			
tEME-AA	$13_{6,8}$-$13_{5,9}$	263544.696	76.6	5.71	†			
tEME-EE	$12_{6,6}$-$12_{5,7}$	263550.619	71.5	5.11	...	...	0.14	SO_2
tEME-EE'	$12_{6,6}$-$12_{5,7}$	263550.679	71.5	5.11	†			
tEME-AE	$12_{6,6}$-$12_{5,7}$	263551.125	71.5	5.11	†			
tEME-EE'	$12_{6,7}$-$12_{5,8}$	263551.945	71.5	5.11	†			
tEME-EE	$12_{6,7}$-$12_{5,8}$	263552.004	71.5	5.11	†			
tEME-AE	$12_{6,7}$-$12_{5,8}$	263552.451	71.5	5.11	†			
tEME-EA	$12_{6,7}$-$12_{5,8}$	263554.279	71.5	5.11	...	...	0.16	SO_2
tEME-EA	$12_{6,6}$-$12_{5,7}$	263554.338	71.5	5.11	†			
tEME-AA	$12_{6,6}$-$12_{5,7}$	263554.783	71.5	5.11	†			
tEME-AA	$12_{6,7}$-$12_{5,8}$	263554.787	71.5	5.11	†			
tEME-EE	$11_{6,5}$-$11_{5,6}$	263558.451	66.9	4.49	...	...	0.13	SO_2
tEME-EE'	$11_{6,5}$-$11_{5,6}$	263558.511	66.9	4.49	†			
tEME-AE	$11_{6,5}$-$11_{5,6}$	263558.959	66.9	4.49	†			
tEME-EE'	$11_{6,6}$-$11_{5,7}$	263559.780	66.9	4.49	...	...	0.13	SO_2
tEME-EE	$11_{6,6}$-$11_{5,7}$	263559.839	66.9	4.49	†			
tEME-AE	$11_{6,6}$-$11_{5,7}$	263560.288	66.9	4.49	†			
tEME-EA	$11_{6,6}$-$11_{5,7}$	263562.118	66.9	4.49	...	...	0.15	SO_2
tEME-EA	$11_{6,5}$-$11_{5,6}$	263562.178	66.9	4.49	†			
tEME-AA	$11_{6,5}$-$11_{5,6}$	263562.626	66.9	4.49	†			
tEME-AA	$11_{6,6}$-$11_{5,7}$	263562.627	66.9	4.49	†			
tEME-EE	$10_{6,4}$-$10_{5,5}$	263564.386	62.7	3.85	...	...	0.11	SO_2
tEME-EE'	$10_{6,4}$-$10_{5,5}$	263564.446	62.7	3.85	†			
tEME-AE	$10_{6,4}$-$10_{5,5}$	263564.897	62.7	3.85	†			
tEME-EE'	$10_{6,5}$-$10_{5,6}$	263565.718	62.7	3.85	...	...	0.11	SO_2
tEME-EE	$10_{6,5}$-$10_{5,6}$	263565.777	62.7	3.85	†			
tEME-AE	$10_{6,5}$-$10_{5,6}$	263566.228	62.7	3.85	†			
tEME-EA	$10_{6,5}$-$10_{5,6}$	263568.061	62.7	3.85	...	...	0.21	SO_2
tEME-EA	$10_{6,4}$-$10_{5,5}$	263568.120	62.7	3.85	†			
tEME-AA	$10_{6,4}$-$10_{5,5}$	263568.570	62.7	3.85	†			
tEME-AA	$10_{6,5}$-$10_{5,6}$	263568.571	62.7	3.85	†			
tEME-EE	$9_{6,3}$-$9_{5,4}$	263568.750	58.8	3.19	†			
tEME-EE'	$9_{6,3}$-$9_{5,4}$	263568.810	58.8	3.19	†			
tEME-AE	$9_{6,3}$-$9_{5,4}$	263569.262	58.8	3.19	†			
tEME-EE'	$9_{6,4}$-$9_{5,5}$	263570.083	58.8	3.19	†			
tEME-EE	$9_{6,4}$-$9_{5,5}$	263570.143	58.8	3.19	†			
tEME-AE	$9_{6,4}$-$9_{5,5}$	263570.595	58.8	3.19	†			
tEME-AE	$8_{6,2}$-$8_{5,3}$	263572.350	55.3	2.50	263572.9	0.47	0.20	CH_3OCH_3, HNCO
tEME-EA	$9_{6,4}$-$9_{5,5}$	263572.430	58.8	3.19	†			
tEME-EA	$9_{6,3}$-$9_{5,4}$	263572.490	58.8	3.19	†			
tEME-AA	$9_{6,3}$-$9_{5,4}$	263572.942	58.8	3.19	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-AA	$9_{6,4}$-$9_{5,5}$	263572.942	58.8	3.19	†			
tEME-EE'	$8_{6,3}$-$8_{5,4}$	263573.172	55.3	2.50	†			
tEME-EE	$8_{6,3}$-$8_{5,4}$	263573.232	55.3	2.50	†			
tEME-AE	$8_{6,3}$-$8_{5,4}$	263573.685	55.3	2.50	†			
tEME-EE	$7_{6,1}$-$7_{5,2}$	263573.911	52.2	1.75	†			
tEME-EE'	$7_{6,1}$-$7_{5,2}$	263573.972	52.2	1.75	†			
tEME-AE	$7_{6,1}$-$7_{5,2}$	263574.426	52.2	1.75	†			
tEME-EE	$6_{6,0}$-$6_{5,1}$	263575.211	49.5	0.93	...	...	0.17	CH_3OCH_3, HNCO
tEME-EE'	$7_{6,2}$-$7_{5,3}$	263575.249	52.2	1.75	†			
tEME-EE'	$6_{6,0}$-$6_{5,1}$	263575.271	49.5	0.93	†			
tEME-EE	$7_{6,2}$-$7_{5,3}$	263575.309	52.2	1.75	†			
tEME-EA	$8_{6,3}$-$8_{5,4}$	263575.522	55.3	2.50	†			
tEME-EA	$8_{6,2}$-$8_{5,3}$	263575.582	55.3	2.50	†			
tEME-AE	$6_{6,0}$-$6_{5,1}$	263575.727	49.5	0.93	†			
tEME-AE	$7_{6,2}$-$7_{5,3}$	263575.764	52.2	1.75	†			
tEME-AE	$6_{6,1}$-$6_{5,2}$	263577.066	49.5	0.93	...	...	0.08	CH_3OCH_3, HNCO
tEME-EA	$7_{6,2}$-$7_{5,3}$	263577.602	52.2	1.75	†			
tEME-EA	$7_{6,1}$-$7_{5,2}$	263577.662	52.2	1.75	†			
tEME-AA	$7_{6,1}$-$7_{5,2}$	263578.117	52.2	1.75	†			
tEME-AA	$7_{6,2}$-$7_{5,3}$	263578.117	52.2	1.75	†			
tEME-EA	$6_{6,1}$-$6_{5,2}$	263578.906	49.5	0.93	†			
tEME-EA	$6_{6,0}$-$6_{5,1}$	263578.966	49.5	0.93	†			
tEME-AA	$6_{6,0}$-$6_{5,1}$	263579.422	49.5	0.93	†			
tEME-AA	$6_{6,1}$-$6_{5,2}$	263579.422	49.5	0.93	†			
tEME-EE	$6_{5,1}$-$5_{4,1}$	263974.290	36.9	4.57	263974.6	0.84	0.32	CH_3CH_2CN v_{20}=1, $CH_3{}^{13}CH_2CN$
tEME-EE'	$6_{5,2}$-$5_{4,2}$	263974.352	36.9	4.57	†			
tEME-EE'	$6_{5,1}$-$5_{4,1}$	263974.491	36.9	4.57	†			
tEME-EE	$6_{5,2}$-$5_{4,2}$	263974.554	36.9	4.57	†			
tEME-AE	$6_{5,1}$-$5_{4,1}$	263974.847	36.9	4.57	†			
tEME-AE	$6_{5,2}$-$5_{4,2}$	263974.909	36.9	4.57	†			
tEME-EA	$6_{5,2}$-$5_{4,2}$	263977.560	36.9	4.57	263977.9	1.19	0.21	CH_3CH_2CN v_{20}=1, $CH_3{}^{13}CH_2CN$, CH_3OCOH v_t=1
tEME-EA	$6_{5,1}$-$5_{4,1}$	263977.761	36.9	4.57	†			
tEME-AA	$6_{5,2}$-$5_{4,1}$	263978.116	36.9	4.57	†			
tEME-AA	$6_{5,1}$-$5_{4,2}$	263978.117	36.9	4.57	†			
tEME-EE'	$12_{4,9}$-$11_{3,8}$	264279.974	48.6	1.86	...	...	0.04	CH_3CH_2CN v_{13}/v_{21}
tEME-AE	$12_{4,9}$-$11_{3,8}$	264281.470	48.6	1.98	†			
tEME-EE	$12_{4,8}$-$11_{3,8}$	264282.160	48.6	2.11	†			
tEME-EA	$12_{4,9}$-$11_{3,8}$	264288.936	48.6	3.18	264290.1	0.32	0.08	CH_3CH_2CN v_{13}/v_{21}
tEME-AA	$12_{4,9}$-$11_{3,8}$	264289.975	48.6	4.89	†			
tEME-EE	$12_{4,8}$-$11_{3,8}$	264290.781	48.6	2.78	†			
tEME-EA	$12_{4,8}$-$11_{3,8}$	264290.868	48.6	1.70	†			
tEME-AE	$12_{4,8}$-$11_{3,8}$	264291.901	48.6	2.91	264292.2	0.33	0.07	CH_3CH_2CN v_{13}/v_{21}
tEME-EE'	$12_{4,8}$-$11_{3,8}$	264292.217	48.6	3.02	†			
tEME-EE'	$12_{4,9}$-$11_{3,9}$	264316.948	48.6	3.02	...	...	0.06	CH_3OH
tEME-AE	$12_{4,9}$-$11_{3,9}$	264318.041	48.6	2.91	†			
tEME-EE	$12_{4,9}$-$11_{3,9}$	264318.385	48.6	2.78	†			
tEME-EA	$12_{4,9}$-$11_{3,9}$	264324.363	48.6	1.70	...	...	0.10	CH_3OH
tEME-AA	$12_{4,8}$-$11_{3,9}$	264326.032	48.6	4.89	†			
tEME-EA	$12_{4,8}$-$11_{3,9}$	264326.294	48.6	3.18	†			
tEME-EE	$12_{4,8}$-$11_{3,9}$	264327.005	48.6	2.11	†			
tEME-AE	$12_{4,8}$-$11_{3,9}$	264328.472	48.6	1.98	...	...	0.04	CH_3OH
tEME-EE'	$12_{4,8}$-$11_{3,9}$	264329.191	48.6	1.86	†			
tEME-EE'	$30_{2,29}$-$29_{1,28}$	264623.050	183.6	14.10	...	...	0.14	CH_3CH_2CN v_{13}/v_{21}
tEME-EE	$30_{2,29}$-$29_{1,28}$	264623.050	183.6	14.10	†			
tEME-AE	$30_{2,29}$-$29_{1,28}$	264623.125	183.6	14.10	†			
tEME-EA	$30_{2,29}$-$29_{1,28}$	264624.097	183.6	14.10	†			
tEME-AA	$30_{2,29}$-$29_{1,28}$	264624.172	183.6	14.10	†			
tEME-AA	$35_{1,34}$-$34_{2,33}$	265627.614	246.2	18.59	...	...	0.13	CH_3COOCH_3
tEME-EA	$35_{1,34}$-$34_{2,33}$	265627.630	246.2	18.59	†			
tEME-AE	$35_{1,34}$-$34_{2,33}$	265628.218	246.2	18.59	†			
tEME-EE	$35_{1,34}$-$34_{2,33}$	265628.234	246.2	18.59	†			
tEME-EE'	$35_{1,34}$-$34_{2,33}$	265628.234	246.2	18.59	†			
tEME-EE'	$19_{3,17}$-$18_{2,16}$	265859.733	83.8	5.59	...	...	0.13	HCN
tEME-EE	$19_{3,17}$-$18_{2,16}$	265859.748	83.8	5.59	†			
tEME-AE	$19_{3,17}$-$18_{2,16}$	265860.022	83.8	5.59	†			
tEME-EA	$19_{3,17}$-$18_{2,16}$	265862.261	83.8	5.59	...	...	0.09	HCN
tEME-AA	$19_{3,17}$-$18_{2,16}$	265862.543	83.8	5.59	†			
tEME-EA	$34_{0,34}$-$33_{1,33}$	266065.053	226.0	28.77	...	...	0.28	CH_3COCH_3
tEME-AA	$34_{0,34}$-$33_{1,33}$	266065.056	226.0	28.77	†			
tEME-EE	$34_{0,34}$-$33_{1,33}$	266065.087	226.0	28.77	†			
tEME-EE'	$34_{0,34}$-$33_{1,33}$	266065.087	226.0	28.77	†			
tEME-AE	$34_{0,34}$-$33_{1,33}$	266065.091	226.0	28.77	†			
tEME-EE	$18_{3,15}$-$17_{2,16}$	267851.372	76.5	5.09	267851.6	0.71	0.13	CH_3OCOH v_t=2
tEME-EE'	$18_{3,15}$-$17_{2,16}$	267851.394	76.5	5.09	†			
tEME-AE	$18_{3,15}$-$17_{2,16}$	267851.682	76.5	5.09	†			
tEME-EA	$18_{3,15}$-$17_{2,16}$	267853.764	76.5	5.09	...	...	0.09	CH_3OCOH v_t=2
tEME-AA	$18_{3,15}$-$17_{2,16}$	267854.063	76.5	5.09	†			
tEME-EE'	$34_{1,34}$-$33_{0,33}$	267994.638	226.1	28.78	267994.7	0.95	0.28	CH_3OCOH v_t=2, CH_3CH_2CN
tEME-EE	$34_{1,34}$-$33_{0,33}$	267994.638	226.1	28.78	†			
tEME-AE	$34_{1,34}$-$33_{0,33}$	267994.646	226.1	28.78	†			
tEME-EA	$34_{1,34}$-$33_{0,33}$	267994.729	226.1	28.78	†			
tEME-AA	$34_{1,34}$-$33_{0,33}$	267994.737	226.1	28.78	†			
tEME-EE'	$31_{2,30}$-$30_{1,29}$	270379.929	195.5	14.99	270380.3	0.21	0.15	

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-EE	$31_{2,30}$-$30_{1,29}$	270379.929	195.5	14.99	†			
tEME-AE	$31_{2,30}$-$30_{1,29}$	270379.998	195.5	14.99	†			
tEME-EA	$31_{2,30}$-$30_{1,29}$	270380.924	195.5	14.99	†			
tEME-AA	$31_{2,30}$-$30_{1,29}$	270380.993	195.5	14.99	†			
tEME-EE	$7_{5,2}$-$6_{4,2}$	272025.103	39.6	4.70	272025.5	1.10	0.35	CH_3CH_2CN v_{13}/v_{21}
tEME-EE’	$7_{5,3}$-$6_{4,3}$	272025.167	39.6	4.70	†			
tEME-EE’	$7_{5,2}$-$6_{4,2}$	272025.304	39.6	4.70	†			
tEME-EE	$7_{5,3}$-$6_{4,3}$	272025.368	39.6	4.70	†			
tEME-AE	$7_{5,2}$-$6_{4,2}$	272025.659	39.6	4.70	†			
tEME-AE	$7_{5,3}$-$6_{4,3}$	272025.723	39.6	4.70	†			
tEME-EA	$7_{5,3}$-$6_{4,3}$	272028.370	39.6	4.70	272028.6	0.59	0.23	CH_3CH_2CN v_{13}/v_{21}
tEME-EA	$7_{5,2}$-$6_{4,2}$	272028.571	39.6	4.70	†			
tEME-AA	$7_{5,3}$-$6_{4,2}$	272028.925	39.6	4.70	†			
tEME-AA	$7_{5,2}$-$6_{4,3}$	272028.927	39.6	4.70	†			
tEME-EE’	$13_{4,10}$-$12_{3,9}$	272291.842	53.6	2.35	272292.1	0.21	0.03	U-line
tEME-AE	$13_{4,10}$-$12_{3,9}$	272293.250	53.6	2.46	272293.6	0.26	0.05	U-line
tEME-EE	$13_{4,10}$-$12_{3,9}$	272293.863	53.6	2.58	†			
tEME-EA	$13_{4,10}$-$12_{3,9}$	272300.368	53.6	3.94	272301.0	0.18	0.08	CH_3OCOH
tEME-AA	$13_{4,10}$-$12_{3,9}$	272301.238	53.6	5.09	†			
tEME-EE	$13_{4,9}$-$12_{3,9}$	272302.533	53.6	2.51	†			
tEME-EA	$13_{4,9}$-$12_{3,9}$	272302.564	53.6	1.15	†			
tEME-AE	$13_{4,9}$-$12_{3,9}$	272303.710	53.6	2.64	272303.9	0.24	0.07	CH_3CH_2CN v_{20}=1
tEME-EE’	$13_{4,9}$-$12_{3,9}$	272304.098	53.6	2.74	†			
tEME-EE’	$13_{4,10}$-$12_{3,10}$	272351.722	53.6	2.74	...	...	0.06	CH_3OH, CH_3OD
tEME-AE	$13_{4,10}$-$12_{3,10}$	272352.884	53.6	2.63	†			
tEME-EE	$13_{4,10}$-$12_{3,10}$	272353.288	53.6	2.51	†			
tEME-EA	$13_{4,10}$-$12_{3,10}$	272359.310	53.6	1.15	...	...	0.13	CH_3OH, CH_3OD
tEME-AA	$13_{4,9}$-$12_{3,10}$	272361.410	53.6	5.09	†			
tEME-EA	$13_{4,9}$-$12_{3,10}$	272361.506	53.6	3.94	†			
tEME-EE	$13_{4,9}$-$12_{3,10}$	272361.957	53.6	2.58	†			
tEME-AE	$13_{4,9}$-$12_{3,10}$	272363.344	53.6	2.46	...	...	0.05	CH_3OH, CH_3OD
tEME-EE’	$13_{4,9}$-$12_{3,10}$	272363.978	53.6	2.35	†			
tEME-EE’	$20_{3,18}$-$19_{2,17}$	272432.754	91.6	5.79	272433.0	0.33	0.14	U-line
tEME-EE	$20_{3,18}$-$19_{2,17}$	272432.765	91.6	5.79	†			
tEME-AE	$20_{3,18}$-$19_{2,17}$	272433.037	91.6	5.79	†			
tEME-EA	$20_{3,18}$-$19_{2,17}$	272435.273	91.6	5.79	272435.7	0.35	0.09	U-line
tEME-AA	$20_{3,18}$-$19_{2,17}$	272435.550	91.6	5.79	†			
tEME-AA	$40_{2,38}$-$39_{3,37}$	272596.983	325.0	12.66	...	...	0.03	U-line
tEME-EA	$40_{2,38}$-$39_{3,37}$	272597.055	325.0	12.66	†			
tEME-AE	$40_{2,38}$-$39_{3,37}$	272598.688	325.0	12.66	†			
tEME-EE	$40_{2,38}$-$39_{3,37}$	272598.760	325.0	12.66	†			
tEME-EE’	$40_{2,38}$-$39_{3,37}$	272598.760	325.0	12.66	†			
tEME-EE	$20_{2,18}$-$19_{1,19}$	273141.137	86.3	2.00	...	...	0.05	CH_3OCOH
tEME-EE’	$20_{2,18}$-$19_{1,19}$	273141.138	86.3	2.00	†			
tEME-AE	$20_{2,18}$-$19_{1,19}$	273141.411	86.3	2.00	†			
tEME-EA	$20_{2,18}$-$19_{1,19}$	273142.818	86.3	2.00	...	...	0.03	CH_3OCOH
tEME-AA	$20_{2,18}$-$19_{1,19}$	273143.092	86.3	2.00	†			
tEME-EA	$35_{0,35}$-$34_{1,34}$	273979.063	239.2	29.79	273979.1	0.73	0.28	CH_3CH_2CN, SO_2
tEME-AA	$35_{0,35}$-$34_{1,34}$	273979.067	239.2	29.79	†			
tEME-EE	$35_{0,35}$-$34_{1,34}$	273979.089	239.2	29.79	†			
tEME-EE’	$35_{0,35}$-$34_{1,34}$	273979.089	239.2	29.79	†			
tEME-AE	$35_{0,35}$-$34_{1,34}$	273979.093	239.2	29.79	†			
tEME-AA	$36_{1,35}$-$35_{2,34}$	274946.543	260.0	19.65	274946.9	0.57	0.14	CH_3OCOH v_t=1, H_2CS
tEME-EA	$36_{1,35}$-$35_{2,34}$	274946.555	260.0	19.65	†			
tEME-AE	$36_{1,35}$-$35_{2,34}$	274947.090	260.0	19.65	†			
tEME-EE	$36_{1,35}$-$35_{2,34}$	274947.102	260.0	19.65	†			
tEME-EE’	$36_{1,35}$-$35_{2,34}$	274947.102	260.0	19.65	†			
tEME-EE’	$35_{1,35}$-$34_{0,34}$	275618.927	239.3	29.80	275618.9	0.22	0.28	
tEME-EE	$35_{1,35}$-$34_{0,34}$	275618.927	239.3	29.80	†			
tEME-AE	$35_{1,35}$-$34_{0,34}$	275618.934	239.3	29.80	†			
tEME-EA	$35_{1,35}$-$34_{0,34}$	275619.009	239.3	29.80	†			
tEME-AA	$35_{1,35}$-$34_{0,34}$	275619.016	239.3	29.80	†			
tEME-EE’	$32_{2,31}$-$31_{1,30}$	276219.631	207.8	15.92	276219.6	0.34	0.15	$^{13}CH_3OCOH$
tEME-EE	$32_{2,31}$-$31_{1,30}$	276219.631	207.8	15.92	†			
tEME-AE	$32_{2,31}$-$31_{1,30}$	276219.695	207.8	15.92	†			
tEME-EA	$32_{2,31}$-$31_{1,30}$	276220.573	207.8	15.92	†			
tEME-AA	$32_{2,31}$-$31_{1,30}$	276220.637	207.8	15.92	†			
tEME-EE	$19_{3,16}$-$18_{2,17}$	276700.152	83.9	5.20	276700.3	0.29	0.13	CH_3CN v_8=1, CH_3OH
tEME-EE’	$19_{3,16}$-$18_{2,17}$	276700.167	83.9	5.20	†			
tEME-AE	$19_{3,16}$-$18_{2,17}$	276700.458	83.9	5.20	†			
tEME-EA	$19_{3,16}$-$18_{2,17}$	276702.533	83.9	5.20	276702.5	0.34	0.08	CH_3CN v_8=1, CH_3OH
tEME-AA	$19_{3,16}$-$18_{2,17}$	276702.832	83.9	5.20	†			
tEME-EE’	$21_{3,19}$-$20_{2,18}$	278825.580	99.7	6.00	278825.7	0.39	0.14	CH_3CH_2CN, CH_3CH_2CN v_{20}=1, $CH_3{}^{13}CH_2CN$
tEME-EE	$21_{3,19}$-$20_{2,18}$	278825.588	99.7	6.00	†			
tEME-AE	$21_{3,19}$-$20_{2,18}$	278825.856	99.7	6.00	†			
tEME-EA	$21_{3,19}$-$20_{2,18}$	278828.090	99.7	6.00	278828.4	0.33	0.09	CH_3CH_2CN, CH_3CH_2CN v_{20}=1, $CH_3{}^{13}CH_2CN$
tEME-AA	$21_{3,19}$-$20_{2,18}$	278828.362	99.7	6.00	†			
tEME-EE	$8_{5,3}$-$7_{4,3}$	280075.262	42.7	4.85	280075.6	0.40	0.38	
tEME-EE’	$8_{5,4}$-$7_{4,4}$	280075.328	42.7	4.85	†			
tEME-EE’	$8_{5,3}$-$7_{4,3}$	280075.462	42.7	4.85	†			
tEME-EE	$8_{5,4}$-$7_{4,4}$	280075.527	42.7	4.85	†			
tEME-AE	$8_{5,3}$-$7_{4,3}$	280075.816	42.7	4.85	†			
tEME-AE	$8_{5,4}$-$7_{4,4}$	280075.882	42.7	4.85	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed(1) frequency (MHz)	Observed(1) T_{MB} (K)	Model(2) T_{MB} (K)	Blends
tEME-EA	$8_{5,4}$-$7_{4,4}$	280078.526	42.7	4.85	280078.5	0.31	0.25	
tEME-EA	$8_{5,3}$-$7_{4,3}$	280078.726	42.7	4.85	†			
tEME-AA	$8_{5,4}$-$7_{4,3}$	280079.076	42.7	4.85	†			
tEME-AA	$8_{5,3}$-$7_{4,4}$	280079.084	42.7	4.85	†			
tEME-EE'	$14_{4,11}$-$13_{3,10}$	280288.955	59.0	2.84	...	...	0.07	CH_3COOH v_t=1
tEME-AE	$14_{4,11}$-$13_{3,10}$	280290.299	59.0	2.96	†			
tEME-EE	$14_{4,11}$-$13_{3,10}$	280290.853	59.0	3.11	†			
tEME-EA	$14_{4,11}$-$13_{3,10}$	280297.013	59.0	4.69	280297.7	0.12	0.10	
tEME-AA	$14_{4,11}$-$13_{3,10}$	280297.720	59.0	5.30	†			
tEME-EE	$14_{4,10}$-$13_{3,10}$	280299.704	59.0	2.19	280301.1	0.10	0.06	U-line
tEME-EA	$14_{4,10}$-$13_{3,10}$	280299.889	59.0	0.61	†			
tEME-AE	$14_{4,10}$-$13_{3,10}$	280300.898	59.0	2.34	†			
tEME-EE'	$14_{4,10}$-$13_{3,10}$	280301.316	59.0	2.46	†			
tEME-EE'	$14_{4,11}$-$13_{3,11}$	280383.694	59.0	2.46	280385.0	0.11	0.06	CH_3OCOH v_t=1
tEME-AE	$14_{4,11}$-$13_{3,11}$	280384.884	59.0	2.34	†			
tEME-EE	$14_{4,11}$-$13_{3,11}$	280385.307	59.0	2.19	†			
tEME-EA	$14_{4,10}$-$13_{3,11}$	280394.040	59.0	4.69	...	...	0.16	CH_3OCOH
tEME-AA	$14_{4,10}$-$13_{3,11}$	280394.104	59.0	5.30	†			
tEME-EE	$14_{4,10}$-$13_{3,11}$	280394.157	59.0	3.11	†			
tEME-AE	$14_{4,10}$-$13_{3,11}$	280395.482	59.0	2.96	†			
tEME-EE'	$14_{4,10}$-$13_{3,11}$	280396.055	59.0	2.83	†			
tEME-EA	$36_{0,36}$-$35_{1,35}$	281871.802	252.8	30.81	281871.7	0.25	0.27	U-line
tEME-AA	$36_{0,36}$-$35_{1,35}$	281871.806	252.8	30.81	†			
tEME-EE	$36_{0,36}$-$35_{1,35}$	281871.822	252.8	30.81	†			
tEME-EE'	$36_{0,36}$-$35_{1,35}$	281871.822	252.8	30.81	†			
tEME-AE	$36_{0,36}$-$35_{1,35}$	281871.826	252.8	30.81	†			
tEME-EE'	$33_{2,32}$-$32_{1,31}$	282152.573	220.4	16.88	282153.2	0.56	0.16	HC_3N v_5=1
tEME-EE	$33_{2,32}$-$32_{1,31}$	282152.573	220.4	16.88	†			
tEME-AE	$33_{2,32}$-$32_{1,31}$	282152.631	220.4	16.88	†			
tEME-EA	$33_{2,32}$-$32_{1,31}$	282153.461	220.4	16.88	†			
tEME-AA	$33_{2,32}$-$32_{1,31}$	282153.519	220.4	16.88	†			
tEME-EE'	$36_{1,36}$-$35_{0,35}$	283263.283	252.8	30.82	283263.4	0.44	0.27	$^{13}CH_3OH$
tEME-EE	$36_{1,36}$-$35_{0,35}$	283263.283	252.8	30.82	†			
tEME-AE	$36_{1,36}$-$35_{0,35}$	283263.290	252.8	30.82	†			
tEME-EA	$36_{1,36}$-$35_{0,35}$	283263.357	252.8	30.82	†			
tEME-AA	$36_{1,36}$-$35_{0,35}$	283263.364	252.8	30.82	†			
tEME-AE	$41_{2,39}$-$40_{3,38}$	283951.422	341.0	13.47	...	...	0.03	CH_3OCH_3
tEME-EE	$41_{2,39}$-$40_{3,38}$	283951.485	341.0	13.47	†			
tEME-EE'	$41_{2,39}$-$40_{3,38}$	283951.485	341.0	13.47	†			
tEME-AA	$37_{1,36}$-$36_{2,35}$	284137.669	274.2	20.72	288138.3	0.34	0.14	CH_3OCOH v_t=1
tEME-EA	$37_{1,36}$-$36_{2,35}$	284137.677	274.2	20.72	†			
tEME-AE	$37_{1,36}$-$36_{2,35}$	284138.161	274.2	20.72	†			
tEME-EE	$37_{1,36}$-$36_{2,35}$	284138.169	274.2	20.72	†			
tEME-EE'	$37_{1,36}$-$36_{2,35}$	284138.169	274.2	20.72	†			
tEME-EE'	$22_{3,20}$-$21_{2,19}$	285037.438	108.2	6.21	...	...	0.14	CH_3CH_2CN v_{13}/v_{21}
tEME-EE	$22_{3,20}$-$21_{2,19}$	285037.444	108.2	6.21	†			
tEME-AE	$22_{3,20}$-$21_{2,19}$	285037.708	108.2	6.21	†			
tEME-EA	$22_{3,20}$-$21_{2,19}$	285039.939	108.2	6.21	...	...	0.09	CH_3CH_2CN v_{13}/v_{21}
tEME-AA	$22_{3,20}$-$21_{2,19}$	285040.206	108.2	6.21	†			
tEME-EE	$20_{3,17}$-$19_{2,18}$	285699.473	91.6	5.28	...	...	0.14	SO_2
tEME-EE'	$20_{3,17}$-$19_{2,18}$	285699.484	91.6	5.28	†			
tEME-AE	$20_{3,17}$-$19_{2,18}$	285699.777	91.6	5.28	†			
tEME-EA	$20_{3,17}$-$19_{2,18}$	285701.840	91.6	5.28	...	...	0.10	SO_2
tEME-AA	$20_{3,17}$-$19_{2,18}$	285702.139	91.6	5.28	†			
tEME-EE	$21_{2,19}$-$20_{1,20}$	286585.825	94.5	1.86	...	...	0.05	CH_3COOH v_t=1
tEME-EE'	$21_{2,19}$-$20_{1,20}$	286585.825	94.5	1.86	†			
tEME-AE	$21_{2,19}$-$20_{1,20}$	286586.110	94.5	1.86	†			
tEME-EA	$21_{2,19}$-$20_{1,20}$	286587.511	94.5	1.86	...	...	0.03	U-line
tEME-AA	$21_{2,19}$-$20_{1,20}$	286587.796	94.5	1.86	†			
tEME-EE	$9_{5,4}$-$8_{4,4}$	288124.443	46.1	5.02	288124.8	0.59	0.41	
tEME-EE'	$9_{5,5}$-$8_{4,5}$	288124.510	46.1	5.02	†			
tEME-EE'	$9_{5,4}$-$8_{4,4}$	288124.641	46.1	5.02	†			
tEME-EE	$9_{5,5}$-$8_{4,5}$	288124.708	46.1	5.02	†			
tEME-AE	$9_{5,4}$-$8_{4,4}$	288124.995	46.1	5.02	†			
tEME-AE	$9_{5,5}$-$8_{4,5}$	288125.062	46.1	5.02	†			
tEME-EA	$9_{5,5}$-$8_{4,5}$	288127.703	46.1	5.02	...	...	0.27	CH_3OCOH
tEME-EA	$9_{5,4}$-$8_{4,4}$	288127.901	46.1	5.02	†			
tEME-AA	$9_{5,5}$-$8_{4,4}$	288128.242	46.1	5.02	†			
tEME-AA	$9_{5,4}$-$8_{4,5}$	288128.268	46.1	5.02	†			
tEME-EE'	$34_{2,33}$-$33_{1,32}$	288187.160	233.4	17.86	288187.5	0.54	0.17	CH_3OCOH
tEME-EE	$34_{2,33}$-$33_{1,32}$	288187.160	233.4	17.86	†			
tEME-AE	$34_{2,33}$-$33_{1,32}$	288187.214	233.4	17.86	†			
tEME-EA	$34_{2,33}$-$33_{1,32}$	288187.993	233.4	17.86	†			
tEME-AA	$34_{2,33}$-$33_{1,32}$	288188.047	233.4	17.86	†			
tEME-EE'	$15_{4,12}$-$14_{3,11}$	288267.539	64.8	3.40	...	...	0.09	$SO^{18}O$, CH_3COCH_3
tEME-AE	$15_{4,12}$-$14_{3,11}$	288268.817	64.8	3.55	†			
tEME-EE	$15_{4,12}$-$14_{3,11}$	288269.302	64.8	3.75	†			
tEME-EA	$15_{4,12}$-$14_{3,11}$	288274.971	64.8	5.24	288275.12	0.14	0.12	$SO^{18}O$
tEME-AA	$15_{4,12}$-$14_{3,11}$	288275.555	64.8	5.50	†			
tEME-EE	$15_{4,11}$-$14_{3,11}$	288278.681	64.8	1.75	...	...	0.05	U-line
tEME-AE	$15_{4,11}$-$14_{3,11}$	288279.849	64.8	1.95	†			
tEME-EE'	$15_{4,11}$-$14_{3,11}$	288280.260	64.8	2.11	†			
tEME-EE'	$15_{4,12}$-$14_{3,12}$	288413.150	64.8	2.11	...	...	0.05	U-line

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed[(1)] frequency (MHz)	Observed[(1)] T_{MB} (K)	Model[(2)] T_{MB} (K)	Blends
tEME-AE	$15_{4,12}$-$14_{3,12}$	288414.329	64.8	1.95	†			
tEME-EE	$15_{4,12}$-$14_{3,12}$	288414.729	64.8	1.75	†			
tEME-EE	$15_{4,11}$-$14_{3,12}$	288424.108	64.8	3.75	288424.7	0.50	0.20	$CH_3OC^{18}OH$
tEME-EA	$15_{4,11}$-$14_{3,12}$	288424.469	64.8	5.24	†			
tEME-AA	$15_{4,11}$-$14_{3,12}$	288424.653	64.8	5.50	†			
tEME-AE	$15_{4,11}$-$14_{3,12}$	288425.361	64.8	3.55	†			
tEME-EE'	$15_{4,11}$-$14_{3,12}$	288425.871	64.8	3.40	†			
tEME-EA	$37_{0,37}$-$36_{1,36}$	289745.973	266.7	31.83	289745.8	0.49	0.26	U-line
tEME-AA	$37_{0,37}$-$36_{1,36}$	289745.977	266.7	31.83	†			
tEME-EE	$37_{0,37}$-$36_{1,36}$	289745.986	266.7	31.83	†			
tEME-EE'	$37_{0,37}$-$36_{1,36}$	289745.986	266.7	31.83	†			
tEME-AE	$37_{0,37}$-$36_{1,36}$	289745.991	266.7	31.83	†			
tEME-EE'	$37_{1,37}$-$36_{0,36}$	290924.982	266.8	31.83	290925.0	0.71	0.27	$^{33}SO_2$
tEME-EE	$37_{1,37}$-$36_{0,36}$	290924.982	266.8	31.83	†			
tEME-AE	$37_{1,37}$-$36_{0,36}$	290924.989	266.8	31.83	†			
tEME-EA	$37_{1,37}$-$36_{0,36}$	290925.049	266.8	31.83	†			
tEME-AA	$37_{1,37}$-$36_{0,36}$	290925.056	266.8	31.83	†			
tEME-AA	$38_{1,37}$-$37_{2,36}$	293203.620	288.8	21.79	293203.7	0.28	0.14	
tEME-EA	$38_{1,37}$-$37_{2,36}$	293203.624	288.8	21.79	†			
tEME-AE	$38_{1,37}$-$37_{2,36}$	293204.059	288.8	21.79	†			
tEME-EE	$38_{1,37}$-$37_{2,36}$	293204.064	288.8	21.79	†			
tEME-EE'	$38_{1,37}$-$37_{2,36}$	293204.064	288.8	21.79	†			
tEME-EE'	$35_{2,34}$-$34_{1,33}$	294329.625	246.8	18.86	294330.0	0.28	0.17	
tEME-EE	$35_{2,34}$-$34_{1,33}$	294329.625	246.8	18.86	†			
tEME-AE	$35_{2,34}$-$34_{1,33}$	294329.673	246.8	18.86	†			
tEME-EA	$35_{2,34}$-$34_{1,33}$	294330.403	246.8	18.86	†			
tEME-AA	$35_{2,34}$-$34_{1,33}$	294330.451	246.8	18.86	†			
tEME-EE	$21_{3,18}$-$20_{2,19}$	294868.623	99.8	5.34	...	...	0.15	CH_3OCOH
tEME-EE'	$21_{3,18}$-$20_{2,19}$	294868.631	99.8	5.34	†			
tEME-AE	$21_{3,18}$-$20_{2,19}$	294868.926	99.8	5.34	†			
tEME-EE	$37_{2,36}$-$36_{2,35}$	294869.441	274.8	36.86	†			
tEME-EE'	$37_{2,36}$-$36_{2,35}$	294869.441	274.8	36.86	†			
tEME-AE	$37_{2,36}$-$36_{2,35}$	294869.456	274.8	36.86	†			
tEME-EA	$37_{2,36}$-$36_{2,35}$	294869.504	274.8	36.86	†			
tEME-AA	$37_{2,36}$-$36_{2,35}$	294869.519	274.8	36.86	†			
tEME-EA	$21_{3,18}$-$20_{2,19}$	294870.971	99.8	5.34	...	...	0.10	CH_3OCOH
tEME-AA	$21_{3,18}$-$20_{2,19}$	294871.271	99.8	5.34	†			
tEME-AA	$42_{2,40}$-$41_{3,39}$	295213.922	357.4	14.32	...	...	0.03	CH_3CN v_8=1
tEME-EA	$42_{2,40}$-$41_{3,39}$	295213.976	357.4	14.32	†			
tEME-AE	$42_{2,40}$-$41_{3,39}$	295215.469	357.4	14.32	†			
tEME-EE	$42_{2,40}$-$41_{3,39}$	295215.522	357.4	14.32	†			
tEME-EE'	$42_{2,40}$-$41_{3,39}$	295215.522	357.4	14.32	†			
tEME-EE	$10_{5,5}$-$9_{4,5}$	296172.265	50.0	5.20	...	...	0.45	SO_2
tEME-EE'	$10_{5,6}$-$9_{4,6}$	296172.333	50.0	5.20	†			
tEME-EE'	$10_{5,5}$-$9_{4,5}$	296172.462	50.0	5.20	†			
tEME-EE	$10_{5,6}$-$9_{4,6}$	296172.530	50.0	5.20	†			
tEME-AE	$10_{5,5}$-$9_{4,5}$	296172.815	50.0	5.20	†			
tEME-AE	$10_{5,6}$-$9_{4,6}$	296172.884	50.0	5.20	†			
tEME-EA	$10_{5,6}$-$9_{4,6}$	296175.521	50.0	5.20	...	...	0.30	SO_2
tEME-EA	$10_{5,5}$-$9_{4,5}$	296175.717	50.0	5.20	†			
tEME-AA	$10_{5,6}$-$9_{4,5}$	296176.037	50.0	5.20	†			
tEME-AA	$10_{5,5}$-$9_{4,6}$	296176.104	50.0	5.20	†			
tEME-EE'	$16_{4,13}$-$15_{3,12}$	296223.035	71.0	4.07	296224.2	0.49	0.11	CH_3OCOH
tEME-AE	$16_{4,13}$-$15_{3,12}$	296224.220	71.0	4.26	†			
tEME-EE	$16_{4,13}$-$15_{3,12}$	296224.598	71.0	4.49	†			
tEME-EA	$16_{4,13}$-$15_{3,12}$	296229.670	71.0	5.60	296230.0	0.30	0.13	CH_3OCOH
tEME-AA	$16_{4,13}$-$15_{3,12}$	296230.175	71.0	5.70	†			
tEME-EE	$16_{4,12}$-$15_{3,12}$	296235.284	71.0	1.21	...	...	0.04	CH_3CH_2CN v_{12}=1
tEME-AE	$16_{4,12}$-$15_{3,12}$	296236.371	71.0	1.44	†			
tEME-EE'	$16_{4,12}$-$15_{3,12}$	296236.725	71.0	1.63	†			
tEME-EE'	$16_{4,13}$-$15_{3,13}$	296440.645	71.0	1.63	...	...	0.04	CH_3CH_2CN
tEME-AE	$16_{4,13}$-$15_{3,13}$	296441.764	71.0	1.44	†			
tEME-EE	$16_{4,13}$-$15_{3,13}$	296442.086	71.0	1.21	†			
tEME-EE	$16_{4,12}$-$15_{3,13}$	296452.772	71.0	4.49	...	...	0.24	CH_3CH_2CN
tEME-EA	$16_{4,12}$-$15_{3,13}$	296453.716	71.0	5.59	†			
tEME-AE	$16_{4,12}$-$15_{3,13}$	296453.915	71.0	4.26	†			
tEME-AA	$16_{4,12}$-$15_{3,13}$	296453.976	71.0	5.70	†			
tEME-EE'	$16_{4,12}$-$15_{3,13}$	296454.335	71.0	4.07	†			
tEME-EE'	$24_{3,22}$-$23_{2,21}$	296926.193	126.4	6.66	296926.5	0.17	0.14	
tEME-EE	$24_{3,22}$-$23_{2,21}$	296926.197	126.4	6.66	†			
tEME-AE	$24_{3,22}$-$23_{2,21}$	296926.450	126.4	6.66	†			
tEME-EA	$24_{3,22}$-$23_{2,21}$	296928.675	126.4	6.66	296928.7	0.42	0.09	CH_3OCOH v_t=2
tEME-AA	$24_{3,22}$-$23_{2,21}$	296928.931	126.4	6.66	†			
tEME-EA	$38_{0,38}$-$37_{1,37}$	297603.969	281.1	32.84	...	...	0.25	CH_3OCOH v_t=2
tEME-AA	$38_{0,38}$-$37_{1,37}$	297603.974	281.1	32.84	†			
tEME-EE	$38_{0,38}$-$37_{1,37}$	297603.978	281.1	32.84	†			
tEME-EE'	$38_{0,38}$-$37_{1,37}$	297603.978	281.1	32.84	†			
tEME-AE	$38_{0,38}$-$37_{1,37}$	297603.982	281.1	32.84	†			
tEME-EE'	$38_{1,38}$-$37_{0,37}$	298601.597	281.1	32.85	...	...	0.26	SO_2
tEME-EE	$38_{1,38}$-$37_{0,37}$	298601.597	281.1	32.85	†			
tEME-AE	$38_{1,38}$-$37_{0,37}$	298601.604	281.1	32.85	†			
tEME-EA	$38_{1,38}$-$37_{0,37}$	298601.658	281.1	32.85	†			
tEME-AA	$38_{1,38}$-$37_{0,37}$	298601.665	281.1	32.85	†			

Table A.2. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed(1) frequency (MHz)	Observed(1) T_{MB} (K)	Model(2) T_{MB} (K)	Blends
tEME-EE	$22_{2,20}$-$21_{1,21}$	300442.750	103.1	1.73	...	...	0.05	$H^{13}CCCN$ v_7=1, CH_3OCOH
tEME-EE'	$22_{2,20}$-$21_{1,21}$	300442.750	103.1	1.73	†			
tEME-AE	$22_{2,20}$-$21_{1,21}$	300443.046	103.1	1.73	†			
tEME-EA	$22_{2,20}$-$21_{1,21}$	300444.445	103.1	1.73	...	...	0.03	$H^{13}CCCN$ v_7=1, CH_3OCOH
tEME-AA	$22_{2,20}$-$21_{1,21}$	300444.741	103.1	1.73	†			
tEME-EE'	$36_{2,35}$-$35_{1,34}$	300583.963	260.6	19.88	300584.4	0.25	0.17	
tEME-EE	$36_{2,35}$-$35_{1,34}$	300583.963	260.6	19.88	†			
tEME-AE	$36_{2,35}$-$35_{1,34}$	300584.008	260.6	19.88	†			
tEME-EA	$36_{2,35}$-$35_{1,34}$	300584.687	260.6	19.88	†			
tEME-AA	$36_{2,35}$-$35_{1,34}$	300584.731	260.6	19.88	†			
tEME-AA	$39_{1,38}$-$38_{2,37}$	302148.596	303.8	22.87	...	...	0.14	SO_2
tEME-EA	$39_{1,38}$-$38_{2,37}$	302148.597	303.8	22.87	†			
tEME-AE	$39_{1,38}$-$38_{2,37}$	302148.985	303.8	22.87	†			
tEME-EE	$39_{1,38}$-$38_{2,37}$	302148.986	303.8	22.87	†			
tEME-EE'	$39_{1,38}$-$38_{2,37}$	302148.986	303.8	22.87	†			
tEME-EE'	$25_{3,23}$-$24_{2,22}$	302611.864	136.1	6.91	...	...	0.14	CH_3COCH_3
tEME-EE	$25_{3,23}$-$24_{2,22}$	302611.867	136.1	6.91	†			
tEME-AE	$25_{3,23}$-$24_{2,22}$	302612.114	136.1	6.91	†			
tEME-EA	$25_{3,23}$-$24_{2,22}$	302614.334	136.1	6.91	...	...	0.09	CH_3COCH_3
tEME-AA	$25_{3,23}$-$24_{2,22}$	302614.582	136.0	6.91	†			
tEME-EE'	$17_{4,14}$-$16_{3,13}$	304150.005	77.5	4.81	...	...	0.14	CH_2CHCN
tEME-AE	$17_{4,14}$-$16_{3,13}$	304151.052	77.5	4.99	†			
tEME-EE	$17_{4,14}$-$16_{3,13}$	304151.281	77.5	5.19	†			
tEME-EA	$17_{4,14}$-$16_{3,13}$	304155.769	77.5	5.86	...	...	0.14	CH_2CHCN
tEME-AA	$17_{4,14}$-$16_{3,13}$	304156.225	77.5	5.90	†			
tEME-EE	$11_{5,6}$-$10_{4,6}$	304218.289	54.3	5.39	...	...	0.48	CH_3OH
tEME-EE'	$11_{5,7}$-$10_{4,7}$	304218.360	54.3	5.39	†			
tEME-EE'	$11_{5,6}$-$10_{4,6}$	304218.485	54.3	5.39	†			
tEME-EE	$11_{5,7}$-$10_{4,7}$	304218.556	54.3	5.39	†			
tEME-AE	$11_{5,6}$-$10_{4,6}$	304218.838	54.3	5.39	†			
tEME-AE	$11_{5,7}$-$10_{4,7}$	304218.909	54.3	5.39	†			
tEME-EA	$11_{5,7}$-$10_{4,7}$	304221.544	54.3	5.38	...	...	0.32	CH_3OH
tEME-EA	$11_{5,6}$-$10_{4,6}$	304221.733	54.3	5.38	†			
tEME-AA	$11_{5,7}$-$10_{4,6}$	304222.011	54.3	5.39	†			
tEME-AA	$11_{5,6}$-$10_{4,7}$	304222.167	54.3	5.39	†			
tEME-EE	$22_{3,19}$-$21_{2,20}$	304228.127	108.3	5.38	...	...	0.14	CH_3COCH_3
tEME-EE'	$22_{3,19}$-$21_{2,20}$	304228.133	108.3	5.38	†			
tEME-AE	$22_{3,19}$-$21_{2,20}$	304228.430	108.3	5.38	†			
tEME-EA	$22_{3,19}$-$21_{2,20}$	304230.454	108.3	5.38	...	...	0.10	CH_3COCH_3
tEME-AA	$22_{3,19}$-$21_{2,20}$	304230.754	108.3	5.38	†			
tEME-EE	$17_{4,13}$-$16_{3,14}$	304481.623	77.5	5.19	...	...	0.25	CH_3OCOH v_t=1
tEME-AE	$17_{4,13}$-$16_{3,14}$	304482.613	77.5	4.99	†			
tEME-EE'	$17_{4,13}$-$16_{3,14}$	304482.900	77.5	4.81	†			
tEME-EA	$17_{4,13}$-$16_{3,14}$	304483.137	77.5	5.85	†			
tEME-AA	$17_{4,13}$-$16_{3,14}$	304483.441	77.5	5.90	†			
tEME-EA	$39_{0,39}$-$38_{1,38}$	305447.899	295.7	33.86	305448.1	0.96	0.24	CH_3CH_2CN v_{13}/v_{21}
tEME-EE	$39_{0,39}$-$38_{1,38}$	305447.903	295.7	33.86	†			
tEME-EE'	$39_{0,39}$-$38_{1,38}$	305447.903	295.7	33.86	†			
tEME-AA	$39_{0,39}$-$38_{1,38}$	305447.904	295.7	33.86	†			
tEME-AE	$39_{0,39}$-$38_{1,38}$	305447.908	295.7	33.86	†			
tEME-EE	$39_{1,39}$-$38_{0,38}$	306290.978	295.7	33.86	...	...	0.24	CH_3OH
tEME-EE'	$39_{1,39}$-$38_{0,38}$	306290.978	295.7	33.86	†			
tEME-AE	$39_{1,39}$-$38_{0,38}$	306290.985	295.7	33.86	†			
tEME-EA	$39_{1,39}$-$38_{0,38}$	306291.035	295.7	33.86	†			
tEME-AA	$39_{1,39}$-$38_{0,38}$	306291.041	295.7	33.86	†			
tEME-AA	$43_{2,41}$-$42_{3,40}$	306373.059	374.1	15.22	...	...	0.03	CH_3OCH_3
tEME-EA	$43_{2,41}$-$42_{3,40}$	306373.104	374.1	15.22	†			
tEME-AE	$43_{2,41}$-$42_{3,40}$	306374.522	374.1	15.22	†			
tEME-EE	$43_{2,41}$-$42_{3,40}$	306374.567	374.1	15.22	†			
tEME-EE'	$43_{2,41}$-$42_{3,40}$	306374.567	374.1	15.22	†			

Note.- Lines of *trans*-$CH_3CH_2OCH_3$ (tEME) ground state present in the spectral scan of Orion KL from the 30m telescope. Column 1 indicates the species, Column 2 gives the transition, Column 3 the predicted frequency, Column 4 upper level energy, Column 5 the line strength, Column 6 observed frequency at the peak channel of the line (relative to a v_{LSR} of +7.5 km s^{-1}), Col. 7 main beam temperature at the peak channel of the line, and Column 8 shows blends with other molecular species.
(1) Observed frequencies and intensities are not provided for features that appear totally blended with lines from other species. (2) We address all features provided by our model with $T_{MB} > 0.01$ K, $T_{MB} > 0.02$ K, and $T_{MB} > 0.03$ K in the frequency ranges between 80.7−116, 122.7−150, and 150−306.7 GHz, respectively. † Blended with previous line.

Table A.3. Detected lines of *gauche-trans*-n-$CH_3CH_2CH_2OH$.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed frequency (MHz)	T (K)	Blends/ Comments
Gt-n-propanol	$12_{7,6}$-$12_{6,6}$	124417.241	58.0	4.25	124417.1	0.04	30m; U-line
Gt-n-propanol	$12_{7,5}$-$12_{6,6}$	124417.256	58.0	4.89	†		
Gt-n-propanol	$12_{7,6}$-$12_{6,7}$	124418.125	58.0	4.89	124418.2†	0.06	30m; U-line
Gt-n-propanol	$12_{7,5}$-$12_{6,7}$	124418.139	58.0	4.25	†		
Gt-n-propanol	$15_{2,14}$-$14_{1,13}$	141219.413	55.4	9.14	141219.8	0.04	30m
Gt-n-propanol	$6_{5,2}$-$5_{4,1}$	143143.854	21.1	4.51	143144.6	0.10	30m; CH_3CH_2CN v_{12}=1
Gt-n-propanol	$6_{5,1}$-$5_{4,1}$	143143.873	21.1	4.65	†		
Gt-n-propanol	$6_{5,2}$-$5_{4,2}$	143144.406	21.1	4.65	†		
Gt-n-propanol	$6_{5,1}$-$5_{4,2}$	143144.426	21.1	4.51	†		
Gt-n-propanol	$8_{7,2}$-$7_{6,1}$	200433.919	38.9	6.49	200434.4	0.13	30m
Gt-n-propanol	$8_{7,1}$-$7_{6,1}$	200433.919	38.9	6.63	†		
Gt-n-propanol	$8_{7,2}$-$7_{6,2}$	200433.920	38.9	6.63	†		
Gt-n-propanol	$8_{7,1}$-$7_{6,2}$	200433.920	38.9	6.49	†		
Gt-n-propanol	$23_{11,13}$-$23_{10,13}$	200508.301	181.2	8.64	200508.8	0.07	30m
Gt-n-propanol	$23_{11,12}$-$23_{10,13}$	200508.302	181.2	10.20	†		
Gt-n-propanol	$23_{11,13}$-$23_{10,14}$	200508.311	181.2	10.20	†		
Gt-n-propanol	$23_{11,12}$-$23_{10,14}$	200508.312	181.2	8.64	†		
Gt-n-propanol	$9_{7,3}$-$8_{6,2}$	209892.537	43.0	6.54	209892.5	0.19	30m; CH_2CHCN v_{11}=1
Gt-n-propanol	$9_{7,2}$-$8_{6,2}$	209892.538	43.0	6.78	†		
Gt-n-propanol	$9_{7,3}$-$8_{6,3}$	209892.542	43.0	6.78	†		
Gt-n-propanol	$9_{7,2}$-$8_{6,3}$	209892.542	43.0	6.54	†		
Gt-n-propanol	$24_{0,24}$-$23_{1,23}$	210248.928	127.7	22.15	210249.1	0.17	30m
Gt-n-propanol	$24_{1,24}$-$23_{1,23}$	210250.060	127.7	23.86	†		
Gt-n-propanol	$24_{0,24}$-$23_{0,23}$	210250.810	127.7	23.86	210252.8	0.16	30m
Gt-n-propanol	$24_{1,24}$-$23_{0,23}$	210251.942	127.7	22.15	†		
Gt-n-propanol	$44_{12,32}$-$44_{11,34}$	210252.224	517.3	16.71	†		
Gt-n-propanol	$37_{12,26}$-$37_{11,26}$	215663.302	386.2	14.57	...	...	ALMA; CH_3CH_2CN v_{13}/v_{21}
Gt-n-propanol	$37_{12,25}$-$37_{11,26}$	215663.793	386.2	19.40	...	...	"
Gt-n-propanol	$37_{12,26}$-$37_{11,27}$	215663.793	386.2	19.40	...	...	"
Gt-n-propanol	$37_{12,25}$-$37_{11,27}$	215663.793	386.2	19.40	...	...	"
Gt-n-propanol	$37_{12,26}$-$37_{11,27}$	215672.076	386.2	19.40	...	...	ALMA; CH_3COOH v_t=1
Gt-n-propanol	$37_{12,25}$-$37_{11,27}$	215672.568	386.2	14.57	...	...	"
Gt-n-propanol	$24_{3,21}$-$23_{4,20}$	216493.373	143.6	9.36	...	...	ALMA; CH_3OCOH
Gt-n-propanol	$14_{5,10}$-$13_{4,9}$	217132.672	59.3	5.22	...	...	ALMA; $CH_3O^{13}COH$ v_t=1, CH_3OD
Gt-n-propanol	$34_{12,23}$-$34_{11,23}$	217158.546	337.0	13.43	217159.0	0.48	ALMA; CH_3COOCH_3
Gt-n-propanol	$34_{12,22}$-$34_{11,23}$	217158.612	337.0	17.25	†		
Gt-n-propanol	$34_{12,23}$-$34_{11,24}$	217159.977	337.0	17.25	†		
Gt-n-propanol	$34_{12,22}$-$34_{11,24}$	217160.043	337.0	13.43	†		
Gt-n-propanol	$32_{12,21}$-$32_{11,21}$	217935.916	306.4	12.61	...	...	ALMA;CH_3OCH_3, $CH_3O^{13}COH$ v_t=1
Gt-n-propanol	$32_{12,20}$-$32_{11,21}$	217935.931	306.4	15.85	...	...	"
Gt-n-propanol	$32_{12,21}$-$32_{11,22}$	217936.298	306.4	15.85	...	...	"
Gt-n-propanol	$32_{12,20}$-$32_{11,22}$	217936.314	306.4	12.61	...	...	"
Gt-n-propanol	$31_{12,20}$-$31_{11,20}$	218268.548	291.9	12.18	218269.0	0.84	ALMA; U-line
Gt-n-propanol	$31_{12,19}$-$31_{11,20}$	218268.555	291.9	12.15	†		
Gt-n-propanol	$31_{12,20}$-$31_{11,21}$	218268.739	291.9	12.15	†		
Gt-n-propanol	$31_{12,19}$-$31_{11,21}$	218268.746	291.9	12.18	†		
Gt-n-propanol	$30_{12,19}$-$30_{11,19}$	218567.524	277.7	11.74	...	...	ALMA; $CH_3O^{13}COH$ v_t=1
Gt-n-propanol	$30_{12,18}$-$30_{11,19}$	218567.527	277.7	14.45	...	...	"
Gt-n-propanol	$30_{12,19}$-$30_{11,20}$	218567.616	277.7	14.45	...	...	"
Gt-n-propanol	$30_{12,18}$-$30_{11,20}$	218567.619	277.7	11.74	...	...	"
Gt-n-propanol	$29_{12,18}$-$29_{11,18}$	218835.376	264.1	11.28	218835.5	1.05	ALMA; $CH_3{}^{18}OCOH$
Gt-n-propanol	$29_{12,17}$-$29_{11,18}$	218835.377	264.1	13.76	†		
Gt-n-propanol	$29_{12,18}$-$29_{11,19}$	218835.419	264.1	13.76	†		
Gt-n-propanol	$29_{12,17}$-$29_{11,19}$	218835.421	264.1	11.28	†		
Gt-n-propanol	$25_{0,25}$-$24_{1,24}$	218880.233	138.2	23.15	218881.2	0.80	ALMA
Gt-n-propanol	$25_{1,25}$-$24_{1,24}$	218880.912	138.2	24.86	†		
Gt-n-propanol	$25_{0,25}$-$24_{0,24}$	218881.365	138.2	24.86	†		
Gt-n-propanol	$25_{1,25}$-$24_{0,24}$	218882.044	138.2	23.15	†		
Gt-n-propanol	$12_{6,7}$-$11_{5,6}$	218945.655	52.0	5.95	218946.4	0.73	ALMA
Gt-n-propanol	$12_{6,6}$-$11_{5,6}$	218946.539	52.0	6.77	†		
Gt-n-propanol	$12_{6,7}$-$11_{5,7}$	218959.585	52.0	6.77	218960.4	0.76	ALMA
Gt-n-propanol	$16_{3,14}$-$15_{2,14}$	218960.392	65.9	5.29	†		
Gt-n-propanol	$12_{6,6}$-$11_{5,7}$	218960.468	52.0	5.95	†		
Gt-n-propanol	$26_{4,22}$-$25_{5,21}$	219065.066	170.6	6.54	...	...	ALMA; CH_3OCOH v_t=1
Gt-n-propanol	$28_{12,17}$-$28_{11,17}$	219074.469	250.9	10.82	...	...	ALMA; CH_3OCOH v_t=1
Gt-n-propanol	$28_{12,16}$-$28_{11,17}$	219074.470	250.9	13.07	...	...	"
Gt-n-propanol	$28_{12,17}$-$28_{11,18}$	219074.489	250.9	13.07	...	...	"
Gt-n-propanol	$28_{12,16}$-$28_{11,18}$	219074.490	250.9	10.82	...	...	"
Gt-n-propanol	$27_{12,16}$-$27_{11,16}$	219287.021	238.1	10.34	...	...	ALMA; CH_3OCOH v_t=2
Gt-n-propanol	$27_{12,15}$-$27_{11,16}$	219287.021	238.1	12.38	...	...	"
Gt-n-propanol	$27_{12,16}$-$27_{11,17}$	219287.030	238.1	12.38	...	...	"
Gt-n-propanol	$27_{12,15}$-$27_{11,17}$	219287.030	238.1	10.34	...	...	"
Gt-n-propanol	$10_{7,4}$-$9_{6,3}$	219345.954	47.6	6.62	...	...	ALMA; $CH_3O^{13}COH$
Gt-n-propanol	$10_{7,3}$-$9_{6,3}$	219345.955	47.6	6.97	...	...	"
Gt-n-propanol	$10_{7,4}$-$9_{6,4}$	219345.976	47.6	6.97	...	...	"
Gt-n-propanol	$10_{7,3}$-$9_{6,4}$	219345.977	47.6	6.62	...	...	"
Gt-n-propanol	$8_{8,1}$-$7_{7,0}$	219604.840	45.8	7.48	219604.8	1.39	ALMA
Gt-n-propanol	$8_{8,1}$-$7_{7,0}$	219604.840	45.8	7.52	†		
Gt-n-propanol	$8_{8,1}$-$7_{7,0}$	219604.840	45.8	7.52	†		
Gt-n-propanol	$8_{8,1}$-$7_{7,0}$	219604.840	45.8	7.48	†		
Gt-n-propanol	$25_{12,14}$-$25_{11,14}$	219640.715	214.0	9.34	...	...	ALMA; CH_3OCOH v_t=1
Gt-n-propanol	$25_{12,13}$-$25_{11,14}$	219640.715	214.0	11.00	...	...	"

Table A.3. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed frequency (MHz)	T (K)	Blends/ Comments
Gt-n-propanol	$25_{12,14}$-$25_{11,15}$	219640.717	214.0	11.00	...	...	"
Gt-n-propanol	$25_{12,13}$-$25_{11,15}$	219640.717	214.0	9.34	...	...	"
Gt-n-propanol	$22_{12,11}$-$22_{11,11}$	220020.607	181.3	7.74	...	...	ALMA; U-line
Gt-n-propanol	$22_{12,10}$-$22_{11,11}$	220020.607	181.3	8.91	...	...	"
Gt-n-propanol	$22_{12,11}$-$22_{11,12}$	220020.607	181.3	8.91	...	...	"
Gt-n-propanol	$22_{12,10}$-$22_{11,12}$	220020.607	181.3	7.74	...	...	"
Gt-n-propanol	$21_{12,10}$-$21_{11,10}$	220113.805	171.3	7.17	220113.2	0.81	ALMA; U-line, CH_2CHCN v_{11}=1
Gt-n-propanol	$21_{12,9}$-$21_{11,10}$	220113.805	171.3	7.17	†		
Gt-n-propanol	$21_{12,10}$-$21_{11,11}$	220113.805	171.3	7.17	†		
Gt-n-propanol	$21_{12,9}$-$21_{11,11}$	220113.805	171.3	7.17	†		
Gt-n-propanol	$18_{12,7}$-$18_{11,7}$	220313.948	144.0	5.36	220314.2	0.76	ALMA
Gt-n-propanol	$18_{12,6}$-$18_{11,7}$	220313.948	144.0	6.01	†		
Gt-n-propanol	$18_{12,7}$-$18_{11,8}$	220313.948	144.0	6.01	†		
Gt-n-propanol	$18_{12,6}$-$18_{11,8}$	220313.948	144.0	5.36	†		
Gt-n-propanol	$15_{12,4}$-$15_{11,4}$	220422.125	120.8	3.32	220422.3	0.65	ALMA; $^{13}CH_3OCOH$, $CH_3OC^{18}OH$
Gt-n-propanol	$15_{12,3}$-$15_{11,4}$	220422.125	120.8	3.66	†		
Gt-n-propanol	$15_{12,4}$-$15_{11,5}$	220422.125	120.8	3.66	†		
Gt-n-propanol	$15_{12,3}$-$15_{11,5}$	220422.125	120.8	3.32	†		
Gt-n-propanol	$14_{12,2}$-$14_{11,3}$	220443.126	114.0	2.82	...	...	ALMA; CH_3CH_2OH
Gt-n-propanol	$14_{12,3}$-$14_{11,3}$	220443.126	114.0	2.57	...	...	"
Gt-n-propanol	$14_{12,2}$-$14_{11,4}$	220443.126	114.0	2.57	...	...	"
Gt-n-propanol	$14_{12,3}$-$14_{11,4}$	220443.126	114.0	2.82	...	...	"
Gt-n-propanol	$24_{2,22}$-$23_{3,21}$	220450.169	139.1	14.32	...	...	ALMA; CH_3CH_2OCOH
Gt-n-propanol	$13_{12,1}$-$13_{11,3}$	220458.292	107.6	1.77	220458.3	0.36	ALMA
Gt-n-propanol	$13_{12,1}$-$13_{11,2}$	220458.292	107.6	1.94	†		
Gt-n-propanol	$13_{12,2}$-$13_{11,3}$	220458.292	107.6	1.94	†		
Gt-n-propanol	$13_{12,2}$-$13_{11,2}$	220458.292	107.6	1.77	†		
Gt-n-propanol	$26_{0,26}$-$25_{1,25}$	227509.942	149.1	24.15	227510.7	1.03	ALMA
Gt-n-propanol	$26_{1,26}$-$25_{1,25}$	227510.348	149.1	25.86	†		
Gt-n-propanol	$26_{0,26}$-$25_{0,25}$	227510.621	149.1	25.86	†		
Gt-n-propanol	$26_{1,26}$-$25_{0,25}$	227511.028	149.1	24.15	†		
Gt-n-propanol	$11_{7,5}$-$10_{6,4}$	228791.566	52.6	6.71	228791.6	1.08	ALMA
Gt-n-propanol	$11_{7,4}$-$10_{6,4}$	228791.570	52.6	7.18	†		
Gt-n-propanol	$11_{7,5}$-$10_{6,5}$	228791.564	52.6	7.18	†		
Gt-n-propanol	$11_{7,4}$-$10_{6,5}$	228791.658	52.6	6.71	†		
Gt-n-propanol	$9_{8,2}$-$8_{7,1}$	229067.766	49.9	7.49	229066.5	2.40	ALMA; U-line
"	"	"	"	"	229068.4	0.30	30m
Gt-n-propanol	$9_{8,1}$-$8_{7,1}$	229067.766	49.9	7.62	†		
Gt-n-propanol	$9_{8,2}$-$8_{7,2}$	229067.766	49.9	7.62	†		
Gt-n-propanol	$9_{8,1}$-$8_{7,2}$	229067.766	49.9	7.49	†		
Gt-n-propanol	$24_{3,21}$-$23_{3,20}$	229460.087	143.6	23.32	229462.0	0.55	ALMA
Gt-n-propanol	$25_{2,23}$-$24_{3,22}$	229461.862	150.2	15.38	†		
Gt-n-propanol	$23_{4,20}$-$22_{3,19}$	234033.112	133.2	8.73	234033.2	0.74	ALMA; U-line
Gt-n-propanol	$39_{13,27}$-$39_{12,27}$	235206.448	432.7	15.38	...	...	ALMA; CH_3OCOH v_t=1
Gt-n-propanol	$39_{13,26}$-$39_{12,27}$	235206.535	432.7	20.18	...	...	"
Gt-n-propanol	$39_{13,27}$-$39_{12,28}$	235208.140	432.7	20.18	...	...	"
Gt-n-propanol	$39_{13,26}$-$39_{12,28}$	235208.227	432.7	15.38	...	...	"
Gt-n-propanol	$38_{13,26}$-$38_{12,26}$	235684.048	414.9	15.00	...	...	ALMA; DCOOH
Gt-n-propanol	$38_{13,25}$-$38_{12,26}$	235684.093	414.9	19.46	...	...	"
Gt-n-propanol	$38_{13,26}$-$38_{12,27}$	235684.969	414.9	19.46	...	...	"
Gt-n-propanol	$38_{13,25}$-$38_{12,27}$	235685.014	414.9	15.00	...	...	"
Gt-n-propanol	$19_{3,16}$-$18_{2,16}$	236101.301	92.6	8.67	...	...	ALMA; D_2CO, $CH_3^{18}OCOH$
Gt-n-propanol	$37_{13,25}$-$37_{12,25}$	236120.704	397.6	14.60	...	...	ALMA; $CH_3O^{13}COH$, CH_3OCOH v_t=2
Gt-n-propanol	$37_{13,24}$-$37_{12,25}$	236120.726	397.6	18.75	...	...	"
Gt-n-propanol	$37_{13,25}$-$37_{12,26}$	236121.195	397.6	18.75	...	...	"
Gt-n-propanol	$37_{13,24}$-$37_{12,26}$	236121.218	397.6	14.60	...	...	"
Gt-n-propanol	$27_{0,27}$-$26_{1,26}$	236138.084	160.4	25.15	236138.5	0.74	ALMA
Gt-n-propanol	$27_{1,27}$-$26_{1,26}$	236138.327	160.4	26.86	†		
Gt-n-propanol	$27_{0,27}$-$26_{0,26}$	236138.490	160.4	26.86	†		
Gt-n-propanol	$27_{1,27}$-$26_{0,26}$	236138.733	160.4	25.15	†		
Gt-n-propanol	$17_{2,16}$-$16_{1,16}$	236879.561	69.9	2.82	...	...	ALMA; CH_3OCOH
Gt-n-propanol	$35_{13,23}$-$35_{12,23}$	236882.213	364.3	13.78	...	...	"
Gt-n-propanol	$35_{13,22}$-$35_{12,23}$	236882.218	364.3	17.34	...	...	"
Gt-n-propanol	$35_{13,23}$-$35_{12,24}$	236882.345	364.3	17.34	...	...	"
Gt-n-propanol	$35_{13,22}$-$35_{12,24}$	236882.350	364.3	13.78	...	...	"
Gt-n-propanol	$34_{13,22}$-$34_{12,22}$	237212.075	348.4	13.36	...	...	ALMA; CH_3OCOH v_t=2
Gt-n-propanol	$34_{13,21}$-$34_{12,22}$	237212.077	348.4	16.65	...	...	"
Gt-n-propanol	$34_{13,22}$-$34_{12,23}$	237212.141	348.4	16.65	...	...	"
Gt-n-propanol	$34_{13,21}$-$34_{12,23}$	237212.143	348.4	13.36	...	...	"
Gt-n-propanol	$14_{6,9}$-$13_{5,9}$	237691.949	64.3	7.37	237692.7	0.62	ALMA; $^{13}CH_3OCOH$
Gt-n-propanol	$14_{6,8}$-$13_{5,9}$	237697.842	64.3	6.15	237697.2	1.20	ALMA; $^{13}CH_3OCOH$ v_t=1
Gt-n-propanol	$25_{3,22}$-$24_{3,21}$	237779.216	155.0	24.29	...	...	ALMA; $^{13}CH_3OCOH$ v_t=1
Gt-n-propanol	$32_{13,20}$-$32_{12,20}$	237781.304	317.9	12.47	...	...	"
Gt-n-propanol	$32_{13,19}$-$32_{12,20}$	237781.304	317.9	15.26	...	...	"
Gt-n-propanol	$32_{13,20}$-$32_{12,21}$	237781.319	317.9	15.26	...	...	"
Gt-n-propanol	$32_{13,19}$-$32_{12,21}$	237781.319	317.9	12.47	...	...	"
Gt-n-propanol	$31_{13,19}$-$31_{12,19}$	238024.778	303.3	12.01	...	...	ALMA; CH_3OCOH v_t=1
Gt-n-propanol	$31_{13,18}$-$31_{12,19}$	238024.778	303.3	14.57	...	...	"
Gt-n-propanol	$31_{13,19}$-$31_{12,20}$	238024.785	303.3	14.57	...	...	"
Gt-n-propanol	$31_{13,18}$-$31_{12,20}$	238024.785	303.3	12.01	...	...	"
Gt-n-propanol	$16_{5,11}$-$15_{4,12}$	238051.137	73.5	5.21	238051.4	0.64	ALMA
Gt-n-propanol	$37_{6,31}$-$37_{5,33}$	238051.929	342.5	1.83	†	"	"
Gt-n-propanol	$12_{7,6}$-$11_{6,5}$	238226.322	58.0	6.81	...	...	ALMA; CH_3OCOH v_t=1

Table A.3. continued.

Species	Transition $J_{K_a,K_c} - J'_{K'_a,K'_c}$	Predicted frequency (MHz)	E_{upp} (K)	S_{ij}	Observed frequency (MHz)	T (K)	Blends/ Comments
"	"	"	"	"	238226.8	0.25	30m; CH_3OCOH v_t=1
Gt-n-propanol	$12_{7,5}$-$11_{6,5}$	238226.337	58.0	7.42	†		
Gt-n-propanol	$12_{7,6}$-$11_{6,6}$	238226.619	58.0	7.42	†		
Gt-n-propanol	$12_{7,5}$-$11_{6,6}$	238226.633	58.0	6.81	†		
Gt-n-propanol	$30_{13,18}$-$30_{12,18}$	238243.369	289.2	11.53	...	...	ALMA; U-line
Gt-n-propanol	$30_{13,17}$-$30_{12,18}$	238243.369	289.2	13.88	...	...	"
Gt-n-propanol	$30_{13,18}$-$30_{12,19}$	238243.372	289.2	13.88	...	...	"
Gt-n-propanol	$30_{13,17}$-$30_{12,19}$	238243.372	289.2	11.53	...	...	"
Gt-n-propanol	$26_{6,24}$-$25_{3,23}$	238348.325	161.7	16.44	...	...	ALMA; CH_3OCOH
Gt-n-propanol	$29_{13,17}$-$29_{12,17}$	238438.858	275.5	11.05	...	...	ALMA; CH_3OH v_t=1
Gt-n-propanol	$29_{13,16}$-$29_{12,17}$	238438.858	275.5	13.19	...	...	"
Gt-n-propanol	$29_{13,17}$-$29_{12,18}$	238438.859	275.5	13.19	...	...	"
Gt-n-propanol	$29_{13,16}$-$29_{12,18}$	238438.859	275.5	11.05	...	...	"
Gt-n-propanol	$10_{8,3}$-$9_{7,2}$	238528.368	54.5	7.53	238528.6	1.01	ALMA
"	"	"	"	"	238528.8	0.18	30m
Gt-n-propanol	$10_{8,2}$-$9_{7,2}$	238528.368	54.5	7.76	†		
Gt-n-propanol	$10_{8,3}$-$9_{7,3}$	238528.368	54.5	7.76	†		
Gt-n-propanol	$10_{8,2}$-$9_{7,3}$	238528.368	54.5	7.53	†		
Gt-n-propanol	$23_{13,11}$-$23_{12,11}$	239215.407	203.2	7.87	...	...	ALMA; $CH_3{}^{18}OCOH$
Gt-n-propanol	$23_{13,10}$-$23_{12,11}$	239215.407	203.2	9.01	...	...	"
Gt-n-propanol	$23_{13,11}$-$23_{12,12}$	239215.407	203.2	9.01	...	...	"
Gt-n-propanol	$23_{13,10}$-$23_{12,12}$	239215.407	203.2	7.87	...	...	"
Gt-n-propanol	$22_{13,10}$-$22_{12,10}$	239291.987	192.7	7.29	...	...	ALMA; CH_3OCOH v_t=1
Gt-n-propanol	$22_{13,9}$-$22_{12,10}$	239291.987	192.7	8.29	...	...	"
Gt-n-propanol	$22_{13,10}$-$22_{12,11}$	239291.987	192.7	8.29	...	...	"
Gt-n-propanol	$22_{13,9}$-$22_{12,11}$	239291.987	192.7	7.29	...	...	"
Gt-n-propanol	$24_{4,21}$-$23_{3,20}$	239313.697	144.1	9.74	239313.9	0.68	ALMA; CH_3OCOH v_t=2
Gt-n-propanol	$21_{13,9}$-$21_{12,9}$	239356.844	182.7	6.69	239357.4	0.26	ALMA
Gt-n-propanol	$21_{13,8}$-$21_{12,9}$	239356.844	182.7	7.56	†		
Gt-n-propanol	$21_{13,9}$-$21_{12,10}$	239356.844	182.7	7.56	†		
Gt-n-propanol	$21_{13,8}$-$21_{12,10}$	239356.844	182.7	6.69	†		
Gt-n-propanol	$20_{13,8}$-$20_{12,8}$	239411.108	173.2	6.07	239411.6	0.65	ALMA; U-line
Gt-n-propanol	$20_{13,7}$-$20_{12,8}$	239411.108	173.2	6.83	†		
Gt-n-propanol	$20_{13,8}$-$20_{12,9}$	239411.108	173.2	6.83	†		
Gt-n-propanol	$20_{13,7}$-$20_{12,9}$	239411.108	173.2	6.07	†		
Gt-n-propanol	$19_{13,6}$-$19_{12,7}$	239455.850	164.1	6.07	...	...	ALMA; U-line
Gt-n-propanol	$19_{13,7}$-$19_{12,7}$	239455.850	164.1	5.43	...	...	"
Gt-n-propanol	$19_{13,6}$-$19_{12,8}$	239455.850	164.1	5.43	...	...	"
Gt-n-propanol	$19_{13,7}$-$19_{12,8}$	239455.850	164.1	6.07	...	...	"
Gt-n-propanol	$18_{13,5}$-$18_{12,6}$	239492.090	155.5	5.30	...	...	ALMA; CH_3OCOH
Gt-n-propanol	$18_{13,6}$-$18_{12,6}$	239492.090	155.5	4.77	...	...	"
Gt-n-propanol	$18_{13,5}$-$18_{12,7}$	239492.090	155.5	4.77	...	...	"
Gt-n-propanol	$18_{13,6}$-$18_{12,7}$	239492.090	155.5	5.30	...	...	"
Gt-n-propanol	$17_{13,4}$-$17_{12,5}$	239520.792	147.3	4.51	239520.8	0.37	ALMA
Gt-n-propanol	$17_{13,4}$-$17_{12,6}$	239520.792	147.3	4.07	†		
Gt-n-propanol	$17_{13,5}$-$17_{12,5}$	239520.792	147.3	4.07	†		
Gt-n-propanol	$17_{13,5}$-$17_{12,6}$	239520.792	147.3	4.51	†		
Gt-n-propanol	$26_{3,24}$-$25_{2,23}$	239523.360	161.7	16.45	239523.8	0.44	ALMA
Gt-n-propanol	$16_{13,4}$-$16_{12,5}$	239542.869	139.6	3.69	...	...	ALMA; CH_3OCOH
Gt-n-propanol	$16_{13,3}$-$16_{12,5}$	239542.869	139.6	3.35	...	...	"
Gt-n-propanol	$16_{13,3}$-$16_{12,4}$	239542.869	139.6	3.69	...	...	"
Gt-n-propanol	$16_{13,4}$-$16_{12,4}$	239542.869	139.6	3.35	...	...	"
Gt-n-propanol	$28_{0,28}$-$27_{1,27}$	244764.654	172.2	26.16	244765.0	0.80	ALMA
"	"	"	"	"	244765.0	0.08	30m
Gt-n-propanol	$28_{1,28}$-$27_{1,27}$	244764.799	172.2	27.86	†		
Gt-n-propanol	$28_{0,28}$-$27_{0,27}$	244764.897	172.2	27.86	†		
Gt-n-propanol	$28_{1,28}$-$27_{0,27}$	244765.042	172.2	26.16	†		
Gt-n-propanol	$25_{4,22}$-$24_{3,21}$	245104.539	155.3	10.81	245104.4	0.44	ALMA
Gt-n-propanol	$9_{9,1}$-$8_{8,0}$	248228.722	57.7	8.48	248228.5	0.14	30m
Gt-n-propanol	$9_{9,0}$-$8_{8,0}$	248228.722	57.7	8.52	†		
Gt-n-propanol	$9_{9,1}$-$8_{8,1}$	248228.722	57.7	8.52	†		
Gt-n-propanol	$9_{9,0}$-$8_{8,1}$	248228.722	57.7	8.48	†		
Gt-n-propanol	$14_{8,7}$-$13_{7,6}$	276312.369	77.2	7.88	276312.8	0.15	30m
Gt-n-propanol	$14_{8,6}$-$13_{7,6}$	276312.370	77.2	8.60	†		
Gt-n-propanol	$14_{8,7}$-$13_{7,7}$	276312.417	77.2	8.60	†		
Gt-n-propanol	$14_{8,6}$-$13_{7,7}$	276312.419	77.2	7.88	†		
Gt-n-propanol	$10_{10,1}$-$9_{9,0}$	276842.794	71.0	9.48	276842.8	0.10	30m
Gt-n-propanol	$10_{10,0}$-$9_{9,0}$	276842.794	71.0	9.52	†		
Gt-n-propanol	$10_{10,1}$-$9_{9,1}$	276842.794	71.0	9.52	†		
Gt-n-propanol	$10_{10,0}$-$9_{9,1}$	276842.794	71.0	9.48	†		
Gt-n-propanol	$13_{9,5}$-$12_{8,4}$	286069.306	78.6	8.66	286069.5	0.10	30m
Gt-n-propanol	$13_{9,4}$-$12_{8,4}$	286069.306	78.6	9.10	†		
Gt-n-propanol	$13_{9,5}$-$12_{8,5}$	286069.306	78.6	9.10	†		
Gt-n-propanol	$13_{9,4}$-$12_{8,5}$	286069.306	78.6	8.66	†		

Note.- Lines of *gauche-trans*-n-$CH_3CH_2CH_2OH$ (Gt-n-propanol) ground state present in the spectral scan of Orion KL from the IRAM-30 m telescope and the ALMA interferometer. Column 1 indicates the species, Column 2 gives the transition, Column 3 the predicted frequency, Column 4 upper level energy, Column 5 the line strength, Column 6 observed frequency at the peak channel of the line (relative to a v_{LSR} of +8.0 km s^{-1}), Col. 7 temperature at the peak channel of the line (main beam temperature for the IRAM data), and Column 8 shows blends with other molecular species and comments.
† Blended with previous line.